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PACIFIC DISCOVERY

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PRE-DISCOVERY

MEXICO dominates this issue without making it therefore one of *Pacific Discovery's* "special" numbers. The Mexico articles came along in time for the season when thousands of Americans take advantage of the ease and relative economy of a vacation in an interesting foreign country, among them thousands for whom "going abroad" in the classic sense would be as financially possible as a trip to the moon. Familiarity with Mexico has grown to a point where romantic notions are going by the board, to be replaced by a real Mexico that is far more worth seeing and knowing than the storybook version. Miguel Covarrubias introduced his *Mexico South: The Isthmus of Tehuantepec* (Knopf, New York, 1946) with something apropos here:

"It used to be customary to think of Mexico as a barren land – great stretches of semi-desert bristling with cactus and *maguey* plants, a place of rattlesnakes and *burros;* of enigmatic black eyes peering out between straw *sombreros* and garish *sarapes;* of gentle-mannered shy women flitting by like shadows in their blue *rebozos;* of D'Artagnanesque cattle-rustlers strumming guitars and dressed in silver-studded skin-tight pants. It was a sort of musical-comedy nation, where browbeaten peons periodically rose in revolt against their Spanish grandee masters, and were led by bandit generals with magnificent mustachios and oily complexions, whose ruthless and sanguinary exterior concealed a patriotic heart of gold.

"This romantic picture has gradually given way to a less gaudy and increasingly accurate knowledge of the country, acquired through the personal experience of travelers and a deeper insight into Mexican art and history, economy, and sociology won by a new generation of more liberal, open-minded scientists and students. Nearly everybody has heard of the Aztecs and their Emperor Moctezuma, of the Maya, builders of what is often considered the most highly developed indigenous civilization of the American continent. Maya cities buried in the tropical jungle have become the special and favorite province of American archaeologists: libraries have been filled with novels laid in Mexico, with stories of Mexico's bewildering revolutions, with controversial studies of Mexican politics, religious conflicts, agrarian struggles, and oil crises: with countless new books on Mexican art and archaeology."

The editors think of *Pacific Discovery*, each issue, as a door to new information and ideas. One or two readers – no more – have voiced the opinion to us that we lean too heavily on book reviews and literary comment. Behind this practice is the thought that we can thus open the door wider: it must surely be evident that we try to relate reviews to content whenever possible, conscious that anything the length of an article must of necessity leave many questions unanswered. We would send you to good books for more of a subject than our space allows, for wider, even different, views.

PD'S AUTHORS

FROM the anthropology department at Harvard comes the surprising revelation of a well developed *zoo* in America before Europeans came with their institutions – surprising to all but a few scholars like **H. B. Nicholson** who have studied the early chronicles of the Conquest of Mexico. A native of San Diego, our author will soon have completed studies for his doctorate in anthropology. . . . ¶With a Swarthmore and Bread Loaf School of English background, **Miss Annette H. Richards** devotes herself, in Tucson, to writing for a variety of journals. . . . ¶**Dr. Paul R. Needham**, ichthyologist, is professor of zoology at the University of California, Berkeley, and may be found, summers, directing work at Sagehen Creek Fisheries Project near Truckee, California. . . . ¶**Natt N. Dodge** is regional naturalist for the National Park Service in the Southwest, and a well known writer on his wide-ranging interests. . . . ¶The Academy's Astronomy Section leader, Leon E. Salanave, may be seen inside the back cover about to conduct a "trip to the moon" from the podium of the Morrison Planetarium. Yet he can get excited about the sky-viewing possibilities of a smallish mountain hereabouts. Peak in hand worth two on the moon? D.G.K.

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THE COVER

UPPER LEFT: Quetzal bird (see page 9 for source). UPPER RIGHT: Aztec Calendar, as drawn by Carlos Merida for *Made in Mexico* by Patrician Fent Ross. It represents the four suns and the days. LOWER LEFT: Clay tiger god, Zapotec, drawn by Will Huntington for *The Tree of Culture* by Ralph Linton. LOWER RIGHT: One of the Danzantes of Monte Alban, reversed from black-line drawing by Miguel Covarrubias for his *Mexico South.* (The last three by courtesy of Alfred A. Knopf, New York.)

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EDITORIAL THE ROAD TO MANY MEXICOS

WITH SUMMER coming on, a few weeks ago, a friend asked for the loan of Bernal Díaz del Castillo, *The Discovery and Conquest of Mexico 1517-1521*. Seems that she and her five sons – the oldest 14 – were to take off in the station wagon, come school's out, for their own discovery and conquest of the land to the south (father, a university musicologist, was Europe-bound to attend a convention). She knew from much experience that some background reading would get her a great deal more out of the summer – the boys too, mama being better prepared to cope with a five-gun battery of inquisitors.

Besides the Bernal Díaz, we furnished the lady, until D-Day, with Miguel Covarrubias' *Mexico South*, Lesley Byrd Simpson's *Many Mexicos*, Michael Swan's *Temples of the Sun and Moon: a Mexican Journey*, Helen Augur's *Zapotec*, Frances Toor's *New Guide to Mexico*, and G. M. Bashford's *Tourist Guide to Mexico*. (A copy of Patricia Fent Ross' *Made in Mexico: The Story of a Country's Arts and Crafts* came in the mail just as she was leaving; and a book she will enjoy in retrospect is Erna Fergusson's *Mexico Revisited*, coming in the fall.)*

Needless to say, these (and some others we shall mention here) constitute just one small, arbitrary selection of books about Mexico. The list is long, and new ones come regularly to fill an apparently ceaseless demand. Mexico can be all things to all people; Lesley Simpson's widely known title is well chosen. Perhaps it could be said there are as "many Mexicos" as there are visitors to or books about Mexico. You will not know Mexico from reading one book, nor will two visitors there know precisely the same Mexico (any more than you will know the country from taking one short trip across the border). Just as knowledge and enjoyment increase with the extent of observant travel, so do they increase with the reading of good books.

We applaud our friend's thinking first of the moment in history when the Mexico we know was born in the fusion of two great streams of culture, and her wanting to see that moment through the eyes of one who lived it and helped make it. No better point of departure could have been chosen – it is the point from which one can go back in Indian time or forward to the present of a richly endowed modern nation.

"Indian time" is the warp of the fabric of Mexico. "To the Indians," Helen Augur says, "time is vertical, and it does not move 'somewhere.'" It merely rolls up in the endless bolt of succeeding generations as the woof of the present is rhythmically added in the accustomed pattern. "The Indian lives in a present which contains all the time there is," says the author of *Zapotec*, which is to say that to him time is an ocean "which has its waves, tides, currents, but stays within its given space." Time is not, as to us, a running stream.

Returning to our metaphor of the fabric: of course the pattern changes with time and varies with place. But it changes in detail, color, scale, not in motif. The design is both changeless and universal, the same the world over wherever man and land live together in the ancient harmony. We muse on the idea that nostalgia for the long lost harmony subconsciously drives us, the disfranchised, to seek it across our border. "In Oaxaca even an American, as full of anxiety about the future as any other," Helen Augur says, "can feel what Indian time is. Perhaps it is the simplest of all pictures, a man with a wooden plow following his oxen home at sunset. Who can place this picture in our sort of time? It is timeless, the tiller of the earth going home after his day in the sun. The man with his earth-stained plow is one with his race and one with the everlasting forces of nature. The rhythm of labor and rest, of planting and reaping, of prayer and fiesta, this is the pulse of time in Oaxaca," as it is in all of Mexico wherever the Indian holds his ancient franchise on the land.

That franchise is nowhere stronger than in Oaxaca, where "in physique and habits the Zapotecs have evolved without sharp change" during the past 3,000 years or so. In *Zapotec* Helen Augur has blended a scholar's knowledge with warmly human understanding and appreciation to tell a story of land and people. If you would know Indian Mexico at its vital best, visit southernmost Mexico, the Isthmus of Tehuantepec. Just incidentally, the *tehuanas* are among the world's most beautiful women.

With Miss Augur as guide through absorbing pages, you attend a wedding in Juchitán where the loveliest *tehuanas* are found, watch *oaxaqueños* on strike melt with inborn kindness a steel ring of government soldiery, or visit "the primitive world next door," the mountains of Chiapas where, in San Cristóbal Las Casas, that remarkable Danish couple, archeologist-explorers Frans and Gertrud Duby Blom, are your hosts. And wherever you go, you are conscious of the past as part of the present, and vice versa – this blurring of time is part of the impact of the Indian world on the stranger. You watch craftsmen – potters, weavers, smiths – making the same things in the same way as for centuries, for the same purposes of daily living: this wherever commercialism has not taken over yet. And you are drawn inevitably to the places where the actual, physical past is being revealed to sight, especially Monte Albán.

In *Zapotec* as in *Mexico South* you will find the background detail to enrich your reading of our article, "The Dancers of Monte Albán." And Miss Augur

*For bibliographical data on the books discussed in this essay, see under REVIEWS.

makes the sacred mountaintop city the jumping-off place for a look back into the possible origins of the people who, 2,500 years ago, built here what may indeed stand, as Miss Augur says, "unless future excavations in Middle America change the picture, . . . as the *earliest full revelation of a great Indian civilization on our continent*" (italics hers).

Since pre-Columbian Americans did not write books describing their culture in words, we must try to understand the graphic record of picture-manuscripts — the very few that survived Spanish book-burning — and especially the carved symbolic decoration of their ceremonial architecture. Nothing is without significance, it seems, so to study the esthetics of ancient Mexican art is to study theology and metaphysics at the same time. If you have both time and fair reading Spanish, you will find all this richly detailed (and profusely illustrated) in Paul Westheim's *Arte Antiguo de México.*

What strikes us is the complexity as well as the all-pervasiveness of religious belief, and especially the astonishing performance of accurate and intricate scientific observation carried on through centuries — the time factor alone is indicative of a stable and highly organized society — for the sole purpose of explaining physical phenomena in metaphysical terms. For a long time, the ancient Mexicans were the world's best astronomers, nevertheless, and achieved among other things a calendar surpassing any now in general use.

Intriguing as these things are — most visitors to Mexico spend at least part of their time at the famous archeological sites and the museums, and try to learn some of the meaning of of what they see — we dare say the greatest challenge to the friendly outsider is people. What greater satisfaction can there be than to establish rapport with fellow human beings on the other side of a boundary line?

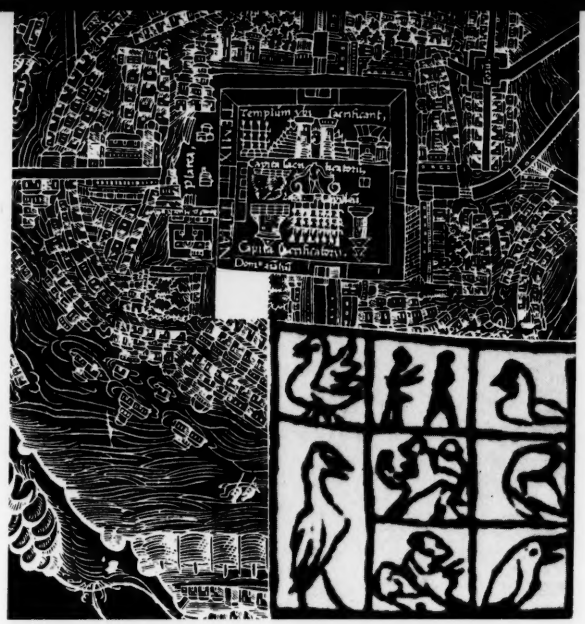
When Michael Swan landed in Vera Cruz recently encumbered with little but a solid English background of literature and the arts, a strong sense of history, and a feeling of kinship with the human race wherever and however situated, he set out to know Mexico through knowing Mexicans. And it was the humble Mexican, the Indian Mexican, he wanted to know — beneath the sarape he would find the enduring Mexico, the Mexico that always was, to which Conquest and colonialism were but a passing unpleasantness to be suffered until it went away in the process of time. The Mexican journey that Michael Swan records in *Temples of the Sun and Moon* is a journey to people as much as to places, and it took him from the Valley of Mexico to British Honduras —again "Mexico South," Indian Mexico.

Indian Mexico speaks a language the whole world understands, the language of craftsmanship. The Indian has always made the things of daily use, for himself and his family or for barter — the potter trading with the weaver, and so forth. His products are not only splendidly functional but beautiful, because the Indian is an artist. Fortunately this craftsmanship has largely withstood the disease of commercialism, and the visitor may still find authentic examples of surviving traditional Indian workmanship and also of such crafts as glassmaking early transplanted from Old Spain which have acquired the status of native Mexican handcraft. It would serve you well, nevertheless, to read such a book as Patricia Fent Ross' *Made in Mexico* before you buy anything. You will learn the traditions behind each craft and what villages produce the best of its kind; you will learn how to eschew the shoddy dollar-bait that passes for the real thing in tourist centers.

Besides the handcrafts Mrs. Ross, who is an instructor in the anthropology department of Mexico City College, tells of architecture, sculpture, painting, literature, cookery, music, dance, drama, and costume. A fascinating chapter is devoted to the now extinct art of feather-painting. It has been said that the Mexican is not particularly inventive, but there can be no doubt that he is exuberantly creative! And his creativity informs and transforms every phase of his life. He likes things both useful and beautiful.

Something of interest to another kind of traveler on the road to Mexico should not be omitted. He is the student, and his Mexico is that of the Universidad Nacional (or other center of learning), where doors may be opened to anthropology and archeology, history, literature, or any of the arts in a stimulating new atmosphere. Mexico's University is the oldest in the New World. To mark its 400th anniversary in 1953, the University of Texas Press published in facsimile and in translation a commemorative edition of a rare and notable book, entitled *Life in the Imperial and Loyal City of Mexico in New Spain and the Royal and Pontifical University of Mexico,* by Francisco Cervantes de Salazar. The book was the first American college Latin text, and consists of a lively dialogue which describes the new university and the new city of Mexico built on the ruins of Tenochtitlán. It is also a treatise on college athletics of those days. We recommend this beautiful yet inexpensive limited edition as the ideal gift for a student or teacher bound for one of Mexico's centers of higher learning; it will help instill a sense of tradition. For the present discussion there is one other point: within 35 years of Cortés' landing, European civilization had been firmly grafted onto the Indian root, complete with a new city, a university, printing and publishing house, and so on. To us, this says a great deal for the strength and resilience of the root!

Now get yourself a guidebook, Toor's or Bashford's, — either will serve you well, and of course there are others — plan your trip, and hit the road to many fascinating Mexicos. D.G.K.



The Conquistadores found golden treasure in Montezuma's halls — and also what may have been the world's finest zoo in those days

H. B. NICHOLSON

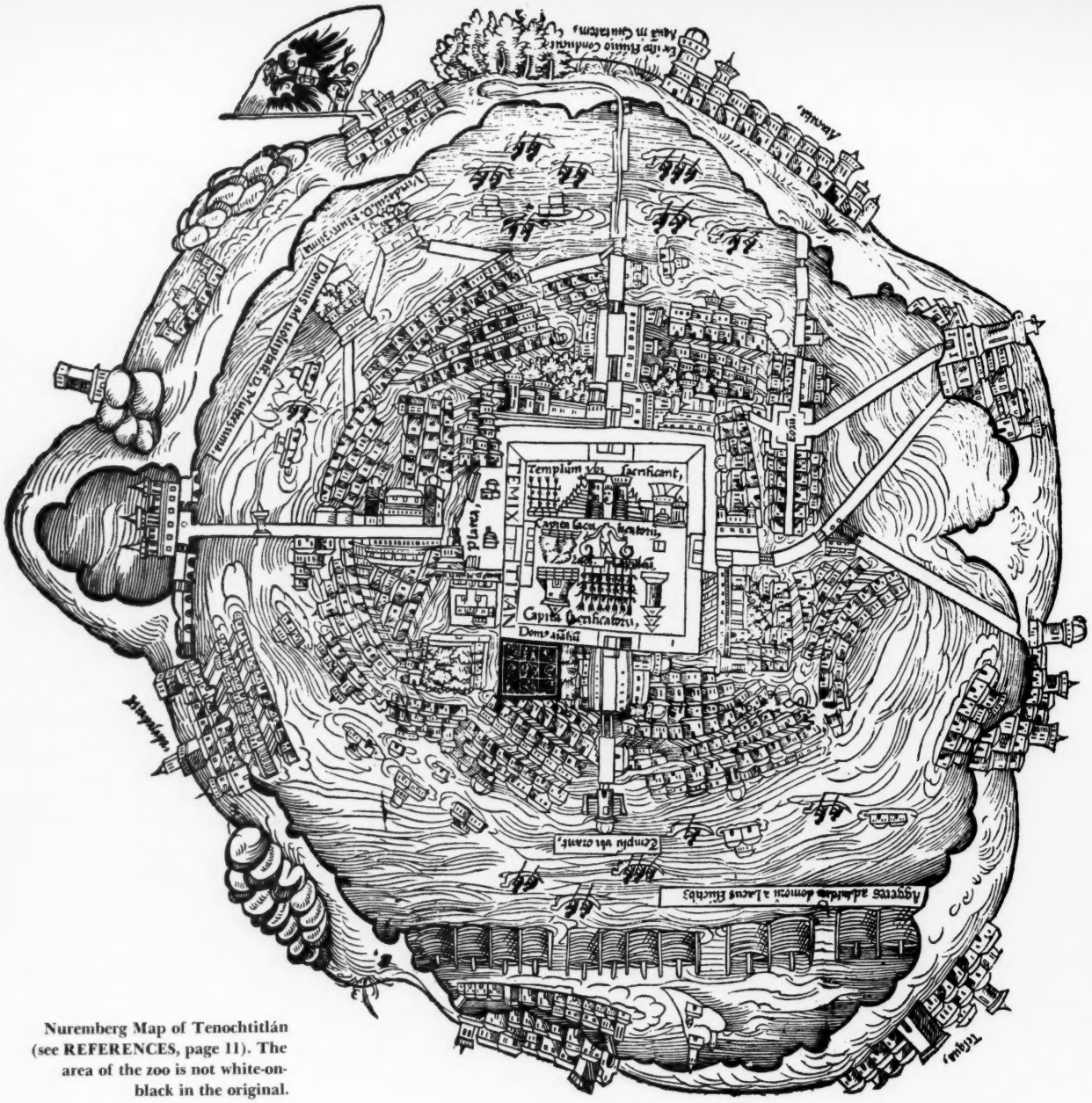
Montezuma's Zoo

THE CUSTOM of keeping wild animals and birds in zoos and exhibiting them for the admiration and instruction of men has had a long history. The institution apparently was first intensively developed by the opulent monarchs of the ancient Near East and the Orient, where zoos served to enhance the beauty and magnificence of the royal establishments. It was continued on a smaller scale by some of the more enlightened rulers of Medieval and Renaissance Europe (Frederick II, Holy Roman Emperor, 1220-1250, is a notable example), until it gradually developed into the great publicly supported institution of today with important scientific purposes.

The idea of the zoo was by no means confined to the Old World, for when the Spanish first entered Mexico in the early sixteenth century they discovered to their astonishment what at that time may have been the most extensive and well-managed animal and bird collection anywhere in the world. It was located in the Aztec capital, Tenochtitlán, from which the famous Montezuma (the common corrupted form of Motecuhzoma) ruled over a widespread tribute empire covering most of central and southern Mexico. Gathered together at great effort from all parts of his dominion, his vast collection was one of the most spectacular features of that unique Venice-like metropolis which drew such admiration from the audacious conquistador who was soon to destroy it, Hernán Cortés.

There are at least seven known accounts of Montezuma's zoo written by witnesses or based directly on their reports. The one by Cortés himself in his second *Carta de Relación* to the Emperor Charles V, dated October 30, 1520, is the most important and is the basis for most of the later accounts. Since it will always be the most reliable and basic source for our knowledge of the zoo, it is worth quoting in full, translating as literally as possible to preserve the full flavor of the original:

He [Montezuma] had a house a little less good than this one where he had a very beautiful garden with certain balconies overlooking it, and its marbles and flagstones were of jasper, very well worked. There were in this house lodgings to accommodate two very great princes and all their retinue. In this house he had ten tanks of water where he had the breeds of water birds which are found in these parts, which are many and diverse, all tame, and for the birds bred to the sea there were tanks of salt water and for those of the river, ponds of fresh water; which water was emptied from time to time for cleanliness, and they



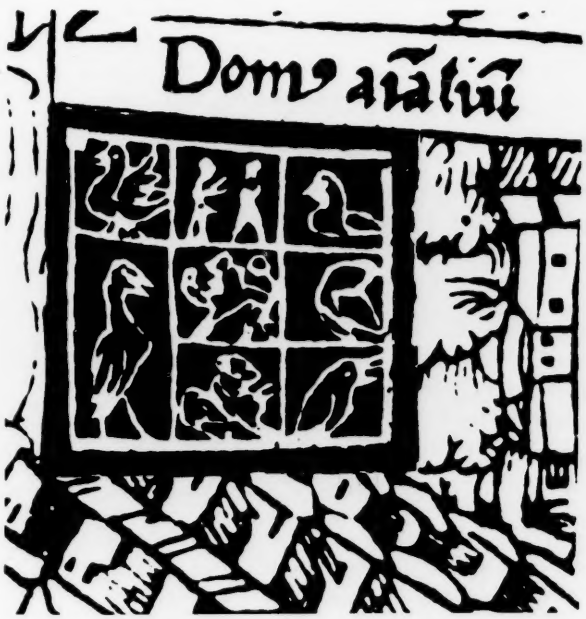
Nuremberg Map of Tenochtitlán (see REFERENCES, page 11). The area of the zoo is not white-on-black in the original.

were refilled through pipes; and each type of bird was given the sustenance proper to its nature and with which they maintained themselves in the wild state. So that for those who fed on fish, such was provided; for those that fed on worms, worms; and for those that fed on maize, maize; and those whose food were smaller seeds consequently were given them. And I certify to your Highness that to the birds which only ate fish were given each day 250 pounds of it, which were caught in the salt lake. There were 300 men to care for these birds, who were occupied in nothing else. There were other men who cared only for the sick birds. Above each pool and the tanks of these birds were corridors and balconies very beautifully worked where the said Muteczuma came to amuse himself and watch them. He had in this house a room in which there were men, women, and children white from birth in the face, body, hair, and eyebrows and eyelashes.

He had another very beautiful house where he had

a great patio paved with very beautiful tiles, all laid out in the manner of a chess board. And the houses (within it) were as deep as eight feet and as large as six paces square; one half of each of these houses was covered by a floor of tiles and the other half had on top a lattice of well made poles, and in each one of these there was a bird of prey, from the sparrow hawk to the eagle, including all the kinds found in Spain and many more kinds which have never been seen there. And of each one of these kinds there were many, and in the covered portion of each one of these houses there was a pole, like a perch, and another was below the lattice, on one of which they stayed at night and when it rained, and the other on which they could sun and air themselves. To all these birds they gave each day nothing but chickens to eat, and no other fare.

There were in this house certain large rooms, low, all filled with large cages, of very stout timbers, very well worked and fitted together, and in all or in most there were lions, tigers, wolves, foxes, and different kinds of cats, many of each, to which they gave to eat as many chickens as they needed. And for these



animals and birds there were another 300 men, who had charge of them.

He had another house where he had many monstrous men and women, in which there were dwarfs, humpbacks, and other deformed persons, and each kind of monster in a room by itself; and there were also persons to take charge of these.

This concise account of the great conqueror is straightforward, clear, and requires little comment. However, it should be mentioned that at this early period, before the newcomers became better acquainted with the resources of the "Indies," many European terms were applied to things which had no exact counterpart in the Old World. For example, for lions and tigers, read jaguars, pumas, and ocelots; for chickens, turkeys; and for jasper, probably *tezontli*, a reddish volcanic stone frequently used in both pre- and post-Conquest buildings in the Valley of Mexico.

A little over a year later a very similar account of the zoo appeared in a letter of Alonzo Zuazo, a Spanish high official of Santo Domingo, written from Santiago, Cuba, November 14, 1521. It was apparently based on information contained in a letter sent some time before from New Spain, for a German news pamphlet printed in 1523 obviously derives at least in part from the same source. This description of the zoo is quite abbreviated, but such animals as "leopards," "wild boars," bears, serpents, toads, frogs, lizards, and even worms are added to the collection. The monsters are also mentioned, including individuals with only one eye or one leg, but the house of aquatic birds is not described.

The next primary account of importance is found in the Fifth Decade of the *De Orbo Novo* of the celebrated Italian humanist, Peter Martyr, then a member of the Spanish Council of the Indies. His version, composed some time in 1522, is based primarily on that of Cortés, but with some interesting changes and embellishments. The "houses" of Cortés are more elegantly referred to as "great palaces"; the albinos have been transferred from the house of aquatic birds to the house of monsters, which now includes persons with two heads; the birds of prey and the water birds are brought together in the same establishment, with the animals in a separate building; and around the ponds in the bird house the simple *"miradores"* of Cortés have become "marble porticos whose pilasters are of marble, alabaster, and jasper."

Later in the same Decade, Martyr describes a fascinating interview with one of the conquistadores who had returned to Spain, Juan de Rivera, secretary to Cortés, who spoke of the destruction of the zoo, of which more below, and described the construction of the buildings in more detail. He stated that the pleasure houses where the animals and birds were kept were "constructed of stone from the foundations, finished with *cre-*

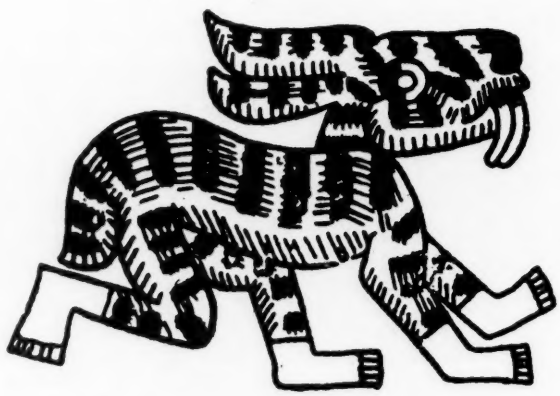
Monkey. *Codex Borgia* 13 (Seler, fig. 22. See REFERENCES, page 11).

neaux, like a fortress," unlike the ordinary houses of Tenochtitlán, which were only built of stone half way up to protect them from inundations.

The *Historia General y Natural de las Indias* of Gonzalo Fernández de Oviedo, first official Chronicler of the Indies, contains two distinct versions of the Conquest of Mexico, one an almost verbatim copy of the letters of Cortés, and the other based on a relation, probably written in the 1530's, which he states he gathered from persons worthy of credit who had taken part in the enterprise. In this latter version there is an important, though perhaps somewhat overdrawn, account of the animal house. It is described as a "great room," 150 feet long and 50 feet broad, constructed of great beams and wooden posts and roofed by a flat terrace, or *azotea.* Within this room, which contained many kinds of birds and animals, there were 50 eagles in cages, plus tigers, lions, wolves, and snakes as thick as a man's leg, of fearful aspect. These beasts were fed with the blood of sacrificed men, women, and children; there was a floor covered with this blood and if one pounded it with a stick it quivered. When one entered the room, the odor was horrible; the snakes gave out with great hisses, and the howls and cries of the other animals created "an infernal melody" which was a fearful thing to hear. Five hundred chickens were fed to these animals every day. In the center of the room was a chapel like "a great oven," covered with sheets of gold, silver, and precious stones, where Montezuma conversed "with the devil," i.e., the god Tezcatlipoca, lord and creator of all things. There is no mention of either the water birds or the monsters and albinos.

Some years after the Conquest, probably between 1540 and 1545, Andrés de Tapia, one of the principal captains of Cortés, wrote a valuable, though incomplete, account of the expedition. His description of the zoo is quite similar to that of his chief and may have been based in part on it. He added certain bits of new information, however, such as stating that in the "*casa de las fieras,*" which had many patios and rooms, Montezuma also kept stores of clothing and other things. He is also the first to describe the method of keeping the snakes, which was in large pottery jars.

A much more important account is that of the one time chaplain of Cortés, López de Gómara, whose *Historia de la Conquista de Mexico,* first published in 1552, contains a long description of the zoo and aviary, obviously based on the previous accounts of Cortés, Oviedo, Tapia, and possibly Martyr. There are a few additional facts, which may have been supplied him orally by Cortés or other participants.



Rabbit. *Codex Borgia* 20 (Seler, fig. 206).

Chapter 62 is entitled "*Casa de aves para pluma,*" his name for the house of aquatic birds. Martyr's jasper pillars reappear, but otherwise his account follows the Cortés letter closely. Grasses, beans, and flies and other insects are added to the birds' fare, but the most important new information is the itemization of the duties of the keepers, a specialization reminiscent of modern practice.

Different persons, he states, cleaned the tanks, fished, fed the birds, deloused them, took care of the eggs, took the birds off the eggs when they became broody, cured their illnesses, and plucked their feathers.

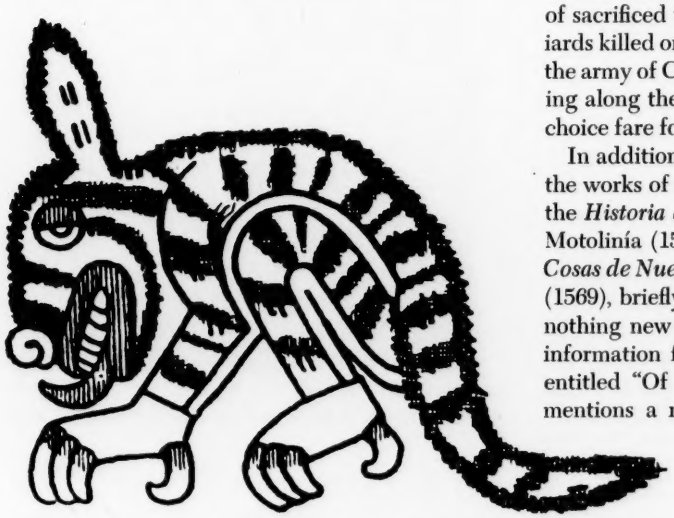
This final duty was perhaps the most important of all, for, as Gómara is the first to stress, "this last was the main thing – the plumage, from which they make rich mantles, coverings, plumed robes, fans, and many other things with gold and silver; a most perfect work." The featherworking craft had been developed to a remarkable degree among the central Mexican peoples at the time of the Conquest, and it is no surprise to learn that the keeping of these numerous birds had a strong practical motivation as well as a merely exhibitory one.

Chapter 63 is entitled "*Casa de aves para caza,*" his term for the house of animals and birds of prey, in which he also places the monsters. He enlarges upon the animals' diet, mentioning deer, duck, and dogs, and is also the first to speak of the existence of crocodiles (or alligators) in the zoo. He states that some claimed the animals were fed on the flesh of sacrificed victims in addition to their blood, but admits that the Spaniards did not actually observe this.

The last eyewitness account to provide anything of value is that of the doughty old conquistador, Bernal Díaz del Castillo, who finished his *La Verdadera Historia de la Conquista de la Nueva España* about 1568. A careful reading of his description of the zoo, however, reveals that he relied to a large extent on the previous account of Gómara, the very author whose work his own was designed to refute. Like his predecessor, Díaz stresses the importance of the birds with beautiful feathers which were plucked and used by the featherworkers in their magnificent creations. He also mentions for the first time the famous quetzal bird, whose gorgeous long green tail feathers were especially prized, as well as parrots of many colors, and flamingos. Like Martyr, he places all the birds, both rapine and aquatic, in one building, with the animals in an establishment apart, where many idols were also kept and to whom the animals were dedicated. The old warrior had been especially impressed by those snakes which carried on the tail "something that made a noise like bells" and which were kept along with the other serpents in great jars lined with feathers where they laid their eggs and raised their young. He also repeats Gómara's story that they were fed with the bodies of sacrificed victims and states that the 800 Spaniards killed on the disastrous "*Noche Triste,*" when the army of Cortés was nearly cut to pieces retreating along the causeway out of the city, served as choice fare for Montezuma's pets for many days.

Eagle. *Codex Nuttall* 53 (Seler, fig. 441).

In addition to these eyewitness-based accounts, the works of two famous Franciscan missionaries, the *Historia de los Indios de la Nueva España* of Motolinía (1541) and the *Historia General de las Cosas de Nueva España* of Bernardino de Sahagún (1569), briefly treat of the zoo. Motolinía supplies nothing new of value, but Sahagún, who got his information from native informants, in a section entitled "Of the Manner of the Royal Houses" mentions a room called *Totocalli,* "bird-house."



Coyote, or related canine. *Codex Nuttall* 26 (Seler, fig. 171).

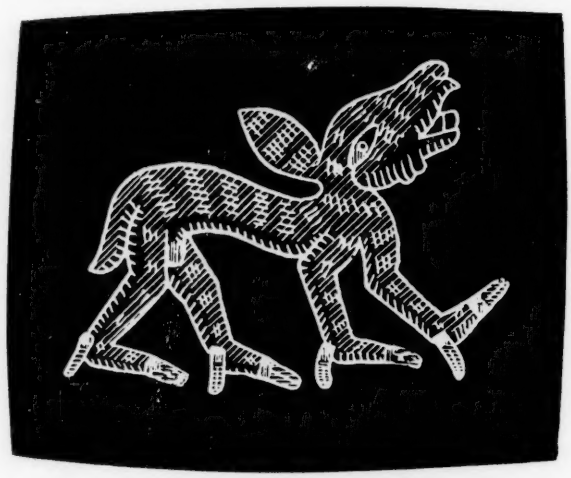
This establishment was staffed by stewards who guarded all kinds of birds; in addition, there assembled here all the craftsmen, such as the metal workers, feather-workers, painters, lapidaries, and sculptors. The stewards who guarded the animals also lived here. Whether this was a part of the zoo-

Jaguar. *Codex Nuttall* 50 (Seler, fig. 66).

aviary itself or a room in Montezuma's palace which served as living quarters for those who administered it, is not entirely clear.

Strangely enough, one of the most important eyewitness accounts of Tenochtitlán, that of the "Anonymous Conqueror," lacks any reference to the zoo, which is also true of the relation of Aguilar, another participant in the venture who later recorded his experiences. Most of the other important writers of the sixteenth and early seventeenth centuries who describe Montezuma's zoo, such as Las Casas, Cervantes de Salazar, Hernández, Herrera, and Torquemada, merely paraphrase or in some cases copy nearly verbatim one or more of these primary sources, especially those of Cortés and Gómara.

One writer, however, later than any of these, deserves special mention, for he placed in the zoo an animal whose presence there, if authentic, would need much explaining. This was Antonio de Solís, whose *Historia de la Conquista de México* was first published in Spain in 1684. His description of the aviary and zoo is more or less standard until he introduces into the collection the *"toro Mexicano,"* the American bison no less, which he colorfully describes as "a very rare composite of various animals, the back hunched and curved like a camel, the flanks lean, with a long tail and long-haired neck region like a lion, cloven hoofs, and the forehead equipped like the bull, whose ferocity it imitates with similar swiftness and performance." As we have seen, none of the known primary sources mention any animal answering to the bison's description. Such a unique beast would undoubtedly have struck the attention of the conquistadores with particular force. The source for Solís' statement is not given, and while it is not impossible that with difficulty Montezuma's agents might have procured a bison for his collection in the grasslands of the far North, it seems unlikely. Apparently the range of the bison in the sixteenth century did not extend into any of the territory that constitutes modern Mexico; the northernmost ramparts of Montezuma's dominion were hundreds of miles south of the Rio Grande. William T. Hornaday, writing on the buffalo in 1887, accepted the statement of Solís, as some later students did. In a recent study of the distribution of the animal, however, F. G. Roe expressed some skepticism. The anthropologist, Erik K. Reed, has even more recently branded the whole tale a myth, and the facts as we know them today would certainly tend to support his conclusion. As is so



Deer. *Codex Borgia* 19 (Seler, fig. 281).

Long-billed black bird. *Codex Nuttall* 69 (Seler, fig. 413).

often the case, this romantic vignette cannot stand up under the cold scrutiny of critical historical method.

This is some evidence that Montezuma's zoo-aviary in Tenochtitlán was not unique, but that many of the sub-rulers of the empire had similar establishments on a smaller scale. The early seventeenth century mestizo writer, Ixtlilxochitl, describes a zoo and aviary at Tezcoco, the city second to Tenochtitlán in size and importance, which, if his account can be relied upon, must have rivaled if not actually surpassed the collection of Montezuma. It was the creation of the famous poet-ruler, Nezahualcoyotl, who had secured every available type of bird and animal, and of those that could not be obtained had ordered images made, "of such a manner that there did not lack a bird, fish, or animal of the whole land that was not there either alive or modeled in stone or gold."

As to the exact location of Montezuma's zoo and aquatic aviary within Tenochtitlán, there are at least two sources which supply valuable information. The earliest is the well known Nuremberg map of Tenochtitlán, published as a woodcut in the Latin translation of the second and third letters of Cortés which appeared in that German city in 1524. Scholars who have studied it most thoroughly believe that it is probably based on an original map sent to Spain by Cortés himself or someone in his army, which, although highly Europeanized, gives a substantially accurate layout of the native city. In it appears a drawing of a structure with the Latin title "*Dom° Aial*" (Domus Animalium), obviously the house for the animals and birds of prey, which is placed southeast of and next to the Great Temple precinct which dominates the central portion of the plan. It is drawn as a nearly square area divided into seven compartments in which various figures are sketchily indicated. Four, possibly five, of these compartments clearly contain birds. The top compartment of the center row contains what seem to be two human figures, probably representing the monsters; the central one, what appears to be a sketchily indicated lion rampant; and the lowermost an obscure figure which may be a flower (representing a garden?). If current ideas on the location of the Great Temple precinct are valid, the animal house was probably situated then in an area bounded in the modern city by Guatemala, Correo Mayor, Emiliano Zapata, and Academia streets, northeast of the Zócalo.

Quetzal bird. *Codex Borgia* 71 (Seler, fig. 344).

Although the tall bird in the lower left hand corner of the square suggests a water fowl, there is other evidence which indicates that the aquatic aviary stood on the periphery of Tenochtitlán, near the lake shore, and was for some reason omitted from the Nuremberg plan. Cristóbal del Castillo, a mestizo writer contemporary with Ixtlilxochitl, states that the great headquarters monastery of the Franciscan order in Mexico was built upon the ruins of the Totocalco, Montezuma's bird

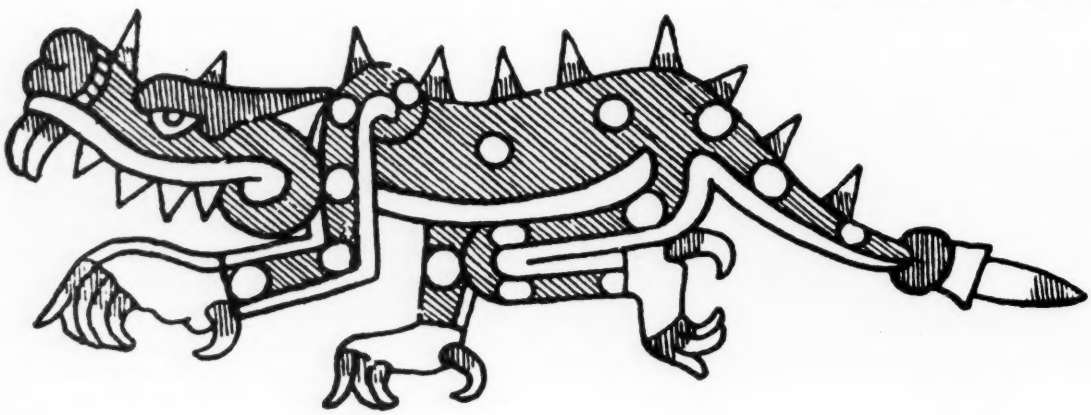
house. His account describes the procession that was formed to inspect the ruins of the ex-aviary, which apparently in 1524 had not been cleaned up since the fall of the city, the subsequent clearing of the rubble, and finally the building of the mother of all Mexican monasteries with the aid of native workmen in such quantities "they appeared like ants." The location of this establishment is well known; it once occupied an area bounded today by the streets of San Juan de Letran, Madero, Bolívar, and Dieciséis de Septiembre. At the present time only a small remnant remains, almost directly across Madero Street from the favorite tourist restaurant, Sanborn's.

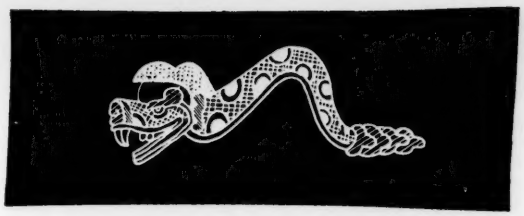
There only remains to describe the tragic fate of this great bird and animal collection. Soon after Montezuma was made a prisoner by Cortés and had rendered the oath of allegiance to the Spanish monarch, the Bird House, in this case probably the aquatic aviary near the lake, was thoroughly looted of all its gold and jewels, contained in various rooms which served as a storehouse for the personal treasure of Montezuma. A certain Juan Alvarez, an eyewitness, testified in a legal proceeding in 1521 that the house of birds was scaled and taken, the doors and walls broken, and all the treasure removed. Andrés de Tapia, on the other hand, states in his relation that this removal was done at the "invitation" of the captive ruler and that he (Tapia) personally took part in it. He was taken to the house of birds by two servants of Montezuma and shown a salon and two other rooms filled with gold, silver, and precious stones, which Cortés ordered taken to the Spanish quarters. Whether this treasure has any connection with Oviedo's gold- and jewel-covered chapel is not clear. The native verson of the Conquest recorded by Sahagún also describes the looting of the Totocalco and tells how, after the Spaniards had taken all the gold and jewels, they piled up the rich featherwork and invited the Tlaxcalan allies to help themselves.

This sacking of the royal aviary was but a mild foretaste of what later occurred during the course of the desperate siege of Tenochtitlán, for all the zoological establishments were ruthlessly destroyed along with the rest of the imperial city. Cortés himself in his third *Carta de Relación* described the burning of the "house of birds" (here apparently the animal-rapine bird house), a destruction carried out under his orders fairly early in the siege. His secretary, Juan de Rivera, who had been present, later in Spain graphically described to Peter Martyr "the howls of the lions, tigers, bears, and the wolves while they were burning in the houses, and the deplorable catastrophe which overtook the natives." He also told the interested Italian that some day the pleasure houses of Montezuma were to be rebuilt.

This, of course, was never done. A hybrid Spanish-Indian city rapidly arose on the broken ruins of Montezuma's metropolis, and in this new order there was no place for the elaborate pleasure establishments of a barbaric ruler surrounding himself with ostentatious reminders of his greatness. The glory of Aztec Tenochtitlán had passed forever and with it the remarkable menagerie that had been not the least of its many wonders.

Crocodile. *Codex Nuttall* 75 (Seler, fig. 669).





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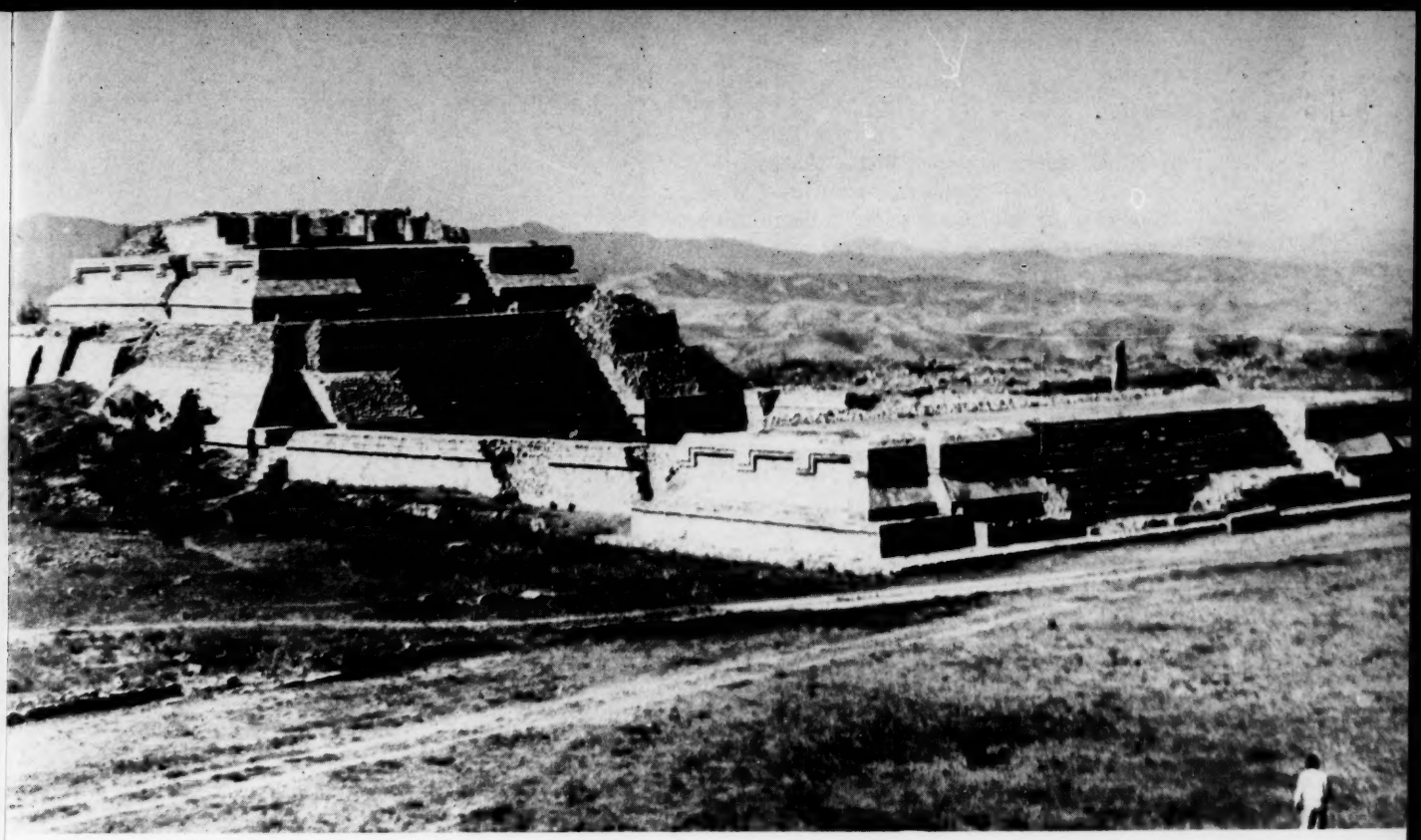
'Los Danzantes'— dancers, freaks, warriors, priests, or medical 'textbook' of Oaxaca's Indian ancients?

The Dancers of Monte Albán

ANNETTE H. RICHARDS

THE REMAINS of two highly-developed pre-Conquest civilizations await those travelers who have the time and opportunity to penetrate beyond the immediate orbit of Mexico City and to go to southern Mexico. Most of us are somewhat familiar with the Maya civilization of Yucatán and Central America and with the Aztec civilization of Mexico's central plateau. But few of us know much about the Zapotec city of Monte Albán or the Mixtec city of Mitla in the State of Oaxaca. This article deals with one aspect of the former archeological site. Though we know that Monte Albán was a Zapotec Indian citadel for some 1,400 years and was conquered by the Mixtec Indians in the 15th century, the identity of its builders is still in doubt. But there is no question that the Zapotec Indians or their predecessors developed here a civilization one writer calls the "earliest full revelation of a great Indian civilization on our continent" (Helen Augur, *Zapotec*, p. 120).

About 225 miles south of Mexico City on the Pan American Highway lies the Emerald City of Oaxaca, located on the Río Atoyac at the juncture of three valleys. And overlooking this lovely old city of green stone houses in its fertile valley is Monte Albán, the White Mountain. Some 2,500 years ago, the ancestors of the region's present inhabitants literally leveled off this mountaintop with crude implements and built into it a sacred city of temples, pyramids, plazas, ball court, observatory, hospital, and tombs covering an area one by one-half miles. Rising 1,000 feet above the valley and five miles outside Oaxaca by car, this mountain was actually sculptured and fashioned



after elaborate plans from crest down to the valley floor with terraces and tombs and all of the wherewithal that goes into the construction of a religious Mecca. Although the Maya and Aztec cities lasted only a few centuries, this vast archeological site of today was a thriving community for some 2,000 years.

Monte Albán was not a city in the ordinary sense; people did not actually live here. Rather it was a place for religious ceremonies and its inhabitants were the high priests and their assistants. The many tombs testify to its use as the burial ground of important personages. Built before Christ, it was dead and forgotten at the time of the Spanish Conquest.

Here was developed with no other instruments than the human eye, a calendar that more closely adhered to solar time than the European system does. Here was played a ball game that preceded baseball by centuries. Here, since 1931, archeologists have been at work uncovering, analyzing, and reconstructing an ancient civilization that puts to shame any false notions we might have had about the "savages" encountered by Cortés. In 1932, Monte Albán came into the world limelight by the discovery in the now-famous Tomb 7 of jewels and artifacts then valued at $1,000,000. Over 500 articles from this tomb were catalogued. They were made of finely-wrought gold, silver, copper, bone, shell, torquoise, jade, jet, amber, mother-of-pearl, obsidian, pearls, rock crystal and alabaster. There were skeletons, crowns, bracelets, beads, bells, chest ornaments, earrings, rattles, urns, vases, and even a human skull encrusted with turquoise.

These jewels, since housed in the State Museum of Oaxaca, have been shown in New York and Chicago, and more recently, in the widely-acclaimed exhibit of Mexican Art which created such a sensation in 1953 in Stockholm, Paris, and London. Buried treasure, a lost fortune—these things alone make headlines. But such a fantastic display not only of the materials themselves but also of the exquisite workmanship employed was truly awe-inspiring.

During and since the excitement caused by this momentous discovery, the archeologists under the direction of Dr. Alfonso Caso quietly continued their painstaking excavations. Over twenty years have passed since serious work was begun on Monte Albán. And this ancient religious city presents an impressive sight, even though its secrets

↑ This partly reconstructed temple gives an idea of the impressive architecture of Oaxaca's ancient religious center, Monte Albán. (Dr. Mario Pérez Ramírez)

← Three typical Danzantes — they are nude, they wear earrings, their heads are shown in profile, and they have stylized sexual tattooing in a flower-like form. (Photograph by the author)

have only begun to be revealed to archeologists.

One of the most important monuments of Monte Albán and certainly one of the most interesting to the visitor is the Templo de los Danzantes, the Temple of the Dancers, which is located on the southern side of the main plaza which measures some 650 by 1,000 feet in size. This temple derives its name from the scores of bas-reliefs in stone which stand at its base and with which part of the temple itself is built. Human figures of all kinds are sculptured on the surfaces of large rocks about four feet high. Because of their dynamic, active poses and variety of positions, they have come to be called "Los Danzantes," the dancers. But actually there is much speculation as to exactly what they really are.

Are they dancers? Are they priests guarding the sacred temple? Are they warriors? When Dr. Caso first worked on Monte Albán, he called attention to the many deformities apparent in these works of art. Some have heads that are too flat; others have heads that are extraordinarily elongated. In some the extremities, usually the feet, are twisted or bent. Most have inverted thumbs on one hand. He also noted hermaphroditic characteristics.

Puzzled, Dr. Caso wondered whether they were attempts at ridiculing their authors' enemies, some conquered race. Since such a large proportion of them are deformed, he thought they might be representations of the sick who came to this temple where lived a god who performed miraculous cures. Was Monte Albán at one time a sort of Lourdes,—a Mecca for the maimed and sick?

Several score of these Danzantes have been found and studied. They were first described in part by Guillermo Depaix in 1806. About a century later, Leopoldo Batres gave them their name. Artist Agustin Villagra has made careful drawings of them. Although most of the Danzantes are located either as part of the southeast corner of the Temple of the Dancers or close by, there are similar relief sculptures in other parts of Monte Albán. Nevertheless, their concentration at the base of the South Platform, as this temple is sometimes called, has distinguished this particular temple of Monte Albán and thus given it its name.

There are two types of Danzantes, though they have many common characteristics. All show great movement and cover the space on the stone fully. Their heads are always pictured in profile with the mouth open. All have thick aquiline noses. Their eyes are depicted by an ellipse with a central horizontal line. Their bodies are stocky. Their necks are so short as to be almost non-existent. And all have a curious curve in the foot.

In the earlier and classic group of Danzantes, the toes with the occasional exception of a big toe, are never shown. The fingers are sometimes indicated and always the thumb. The figures are more mobile, their postures more varied. The lips are thick with the teeth showing. The hands seem to be hanging. There are many old people.

The second, later, or evolutionary type of Danzante was sculptured with deeper lines, and the figures are taller with long limbs, perhaps excessively long. The big toe and thumb are always depicted, and large. The thumb is drawn with two curves. The big toe and thumb nails, always shown, are enormous. Though the mouth is open, the teeth do not show. There is sexual tattooing in contrast to none in the first group.

The Danzantes are usually nude. In a very few cases, there are sandals or shoes, but skirts and blouses are entirely absent even though some of the figures seem to be women. Some of those that seem to be swimming wear hats. Sometimes they wear something on the shoulders or feather adornments on either side of the head. Almost all have ear ornaments, but other than these, there are few fancy trimmings. Frequently there are masks. There is much body tattooing, usually in the sexual area. The legs when standing are flexed. The old people always wear beards, have distended

God of Maize, sculpture on gate to Temple 104. (Author)

mouths sometimes showing one tooth, have a small shoulder hump, and occasionally the back of the head is artificially deformed.

The fact that so many are reclining or seated might seem to substantiate the idea that they are dancers. The theory is that the violence of the ritual ceremonial dance left them exhausted—and hence they are resting following their strenuous exertions.

There has always been speculation about the deformities. When Professor A. W. Lawrence of Cambridge University in England visited Monte Albán in 1948, he was struck with the abnormal figures of the Danzantes and classed them as a study of abnormal formations, teratology. But in 1951, when Dr. Eusebio Dávalos Hurtado, Director of the National Museum of Anthropology in Mexico, made another study of these strange figures, he came to the conclusion that, although many of the Danzantes have deformities or abnormal physical features, they are not teratological. He contends that despite the certain periodicity of monstrosities, they represent artistic license without concern for actual anatomy rather than a deliberate realistic representation of actual deformities seen by the anonymous sculptors.

Dr. Dávalos Hurtado claims that no feminine figures are represented, that they are all masculine. While most early cultures manifest great interest in indicating sexual characteristics, the artists of this culture substituted "flowers" for the actual organs in the same location. A stylized sexual tatooing is apparent in many of the Danzantes. Singers and dancers in many epochs have been undifferentiated sexually, says Dr. Dávalos Hurtado, in explaining this departure from usual primitive art. He believes that these dancers (as he thinks of them) are not only eunuchs but also are totally emasculated. In accordance with the many historical precedents of priests being emasculated, he believes these Danzantes were a group of priests who guarded this temple in the holy city. The epileptic postures of some he contends are the result of the frantic dance previous to being emasculated.

The effects of castration before and after full sexual development could easily account for the differences noted in the two types of Danzantes. Castrated people age early and this could explain the large number of old people among the Danzantes. And if castrated before puberty, the result is a great lengthening of the extremities. He feels that this explanation fits in with the extremely cruel and barbaric western cultures. Since the pre-Conquest village economy revolved around agriculture, why would not the natives sacrifice the generating organs of their priests to please the gods of fertility?

Like most visitors who fly to Oaxaca, I had the incomparable experience of flying right over the impressive White City that is Monte Albán, and of seeing its massive stone temples, pyramids, staircases, and plazas from the overall view that can be seen only from the air. And, although I had been there before, my interest in this still mysterious archeological site was still keen. When we arranged for a guide to drive us up to Monte Albán, our party made the usual tour, climbing to the tops of the temples, exploring narrow passageways, visualizing the ancient ball game that used to fill the narrow stone bleachers overlooking the ball court, noting the tall sundial, wondering at the scientific knowledge of the builders of the observatory, gazing out at the view of the mountain ranges stretching out into the distance in all directions, climbing down the narrow entries into the tombs with their painted walls and clay gods, and snapping photographs.

Here and there we met other parties of tourists browsing around in the warm midday December sun. When our young guide took us to the Temple of the Dancers, he could tell us very little of a definite nature about these extraordinary figures. Many visitors were taking photographs, but at the Temple of the Dancers, I was struck by the carefulness with which a young Mexican was photographing the individual Danzantes. His camera seemed to be of the best. His interest seemed to be so intense as compared to the relatively casual attitude of most of the other visitors we had seen, that I wondered if he were in some way officially connected with the archeological project.

Upon inquiring about his photographic work, I learned that he was a doctor in Oaxaca. He had become intrigued with the mystery of the Danzantes. As a practicing physician, he had noted the high incidence of deformity and abnormality in the figures. So in his spare time he came to Monte Albán to study and photograph the Danzantes and evolve, as a medical man, his theory about this archeological puzzle. He was at this time preparing a paper which he later delivered to the Mexican Society of Geography and History in April, 1953 and to the local Third Regional

Medical and Dental Congress, held in Oaxaca in December, 1953. His name was Dr. Mario Pérez Ramírez.

Dr. Ramírez' theory is that these bas-reliefs are neither warriors, priests, nor dancers. Studying them from a medical point of view, his idea is that they are a sort of medical case history book, a primitive cataloguing of diseases and deformities as a sort of textbook to pass on medical knowledge from one ancient generation to the next.

He first discounts the warrior theory, saying that warriors are the cream of the physical crop, normal, well-proportioned, strong, and trained for arduous battle. Deformed specimens are the last resort for soldier material. In Tomb 104, paintings on the walls represent warriors who wear distinctive clothing and carry weapons. But the Danzantes are mostly nude, are often deformed (or even dead) and carry no weapons.

Dr. Ramírez also disagrees with Dr. Dávolos Hurtado's theory that they are emasculated priests guarding the temple. For although deformed and sick people were probably held in respect, nevertheless these primitive peoples would not insult their gods by choosing inferior physical specimens to minister to them. Moreover, priests wear distinctive robes of office with abundance of religious ornaments. They would not be nude.

His argument against the dancer theory is that dancers need near-perfect bodies to execute the strenuous motions involved in ritual dances. An old or deformed dancer would arouse only ridicule. And here again, dancers almost always wear elaborate costumes with headdresses, necklaces, bracelets, and other adornments.

The pre-Cortés natives of America had professors of medicine who instructed their children in the characteristics of the different diseases to which human beings are subject and in the intricate knowledge of herbs. They taught the different stages of a given disease and the preparation and application of medicines. There are more than 1,200 named plants in Mexico. European medicine is indebted to the knowledge of these ancient peoples for many important medicinal herbs.

What would be more logical and simple an explanation of the Danzantes, asks Dr. Ramírez, than that they are the first medical textbook of Mexico? That these people of long ago carved their knowledge of the pathology of the human

Five Danzantes, selected by Dr. Ramírez to illustrate his theory of their primary medical interest. (Dr. Mario Pérez Ramírez)

body, intended for teaching purposes, into stone? That by this uncomplicated means they passed on their medical knowledge for the enlightenment of future generations?

We know that these people had their governments, their political organizations, their warriors, their ritual and popular dances, that they knew medicine, practiced surgery and dentistry, and had places corresponding to hospitals. Moreover, it was their custom to conserve and transmit their knowledge through the media of painting and sculpture.

The young Oaxaca doctor has built his theory of the Danzantes on what the figures themselves reveal to his medical mind: expressions of agony, the conditions of old age, deformity, and disease. In them, Dr. Ramírez sees epilepsy and pregnancy, birth and stillbirth, humpbacks, deformed hands, feet, and heads—the problems of geriatrics, pediatrics, obstetrics, and orthopedics. Here, he believes, is an ancient record of men, women, and children, in the many phases of their life cycle, normal and abnormal, in permanent form for visual instruction in the medical science of the time.

Whether this diagnosis of the Danzantes is the correct one, whether it actually solves the mystery surrounding these striking sculptures, it nevertheless takes a different approach to one of the secrets of Monte Albán. Perhaps Dr. Caso's original speculation that this temple might have been a sort of Lourdes for the sick and the maimed, presided over by gods who made miraculous cures, may have been on the right track. Since we cannot inquire of the artists themselves and have only their works to go by, we can only hazard intelligent guesses as to their motivations.

As to which theory is the true one about the Danzantes, *quién sabe*? At any rate, the Danzantes are but one of the tantalyzing mysteries in this impressive mountaintop city of the past. In the effort to solve such mysteries of ancient human times, archeology is becoming more and more a synthesis of various sciences, from geology to medicine – each one shedding some light on the problem. With a Batres, a Caso, a Lawrence, a Dávalos Hurtado, a Ramírez, and future investigators yet unnamed, each lighting the Danzantes –and the other notable features of Monte Albán– from a different viewpoint, their true character may one day stand revealed.

Trail of the Mexican Trout

PAUL R. NEEDHAM

EVER SINCE THE DAYS of the Conquistadores, stories of fabulous trout fishing have trickled out of Mexico. Fish stories mixed with rumor and myth were constantly spread by travelers returning from the high Sierra Madre Occidental. Tales were commonly told of giant rainbows in deep barrancas reachable only by long, hard pack trips. Fact began to replace fancy only when some of the early ichthyologists got interested and inquisitive. As early as 1886, Dr. Edward Cope reported trout from the Mexican mainland, in the high mountain streams of southern Chihuahua near the boundaries of Sinaloa and Durango, far south of their known range. Seth Meek, another famed ichthyologist who collected fishes widely in Mexico, in 1904 reported trout from the head of the Río Yaqui and streams draining into the Pacific west of Durango. The next year a U. S. Biological Survey naturalist, E. W. Nelson,* made a 1,000-mile trek on horseback down the Baja California peninsula to La Paz and back. He collected, for the first time, the trout of the Río Santo Domingo at the Rancho San Antonio some 35 miles above its mouth and about 160 miles south of Ensenada. With the collection of these trout, fiction became fact. Describing the new species in 1908, B. W. Evermann† named it *Salmo nelsoni* for his friend. These fish are members of the rainbow trout series, like all trout so far collected in Mexican waters.

Dr. Nelson got around a lot. He described many new species and contributed enormously to our knowledge of animals and plants of the North American continent. He made long horseback treks into the high Sierra Madre Occidental in Mexico and by observation, in 1898, reported the presence of trout on the Mexican mainland at the headwaters of the Río Sinaloa and Río del Presidio, northwest of Durango.

Ichthyologists have long been interested in obtaining trout south of the Mexican border, for three main reasons. First, the continental distribution of salmonids southward and how they were able to migrate from their more boreal centers to the north, has always posed intriguing problems with respect to evolution and speciation in this exceedingly plastic group of fishes. Second, from a more practical standpoint, those concerned with fish cultural problems have believed that Mexican rainbow trout might prove to be less migratory than the various strains of rainbows found naturally on the Pacific Coast north of the border, and have less strong hereditary tendencies to move downstream after their planting from fish hatcheries. Third, Mexican rainbows might prove to be more tolerant of high water temperatures than native stocks in the United States. Natural selection working over hundreds of years would have tended to eliminate those fish unable to stand increasingly high water temperatures following the last continental ice age. If these two theories are true, it would be desirable to introduce the survivors of these strains for stocking streams of the United States where warm water temperatures had eliminated original stocks or where it was desirable to introduce a trout that would "stay put" and not migrate downstream to its destruction in unsuit-

* From 1916 to 1927 Dr. Nelson was chief of his Bureau, which became the Fish and Wildlife Service, Department of the Interior, in 1940.

† Dr. Evermann was Director of the California Academy of Sciences from 1914 until his death in 1932.

The 1937 collecting party meet guides at Valladares, 7 miles via pack train from Rancho San Antonio on the Río Santo Domingo, Baja California. Standing (left to right): Everett Horn, now consultant to California Wildlife Conservation Board; Ignacio Iguerra, guide; Fred W. Johnson, in charge, Division of Wildlife Management, U.S. Forest Service, Region 1; M. Hugo, U.S.F.S. Seated (left to right): Estaban Llewellyn, guide's assistant; H. John Rayner, now chief of Operations, Fisheries Division, Oregon State Game Commission. (Photo by the author)

ologists *investigate piscatorial puzzle in Mexico's mountain streams*

able habitats in lower waters. These were the reasons Fred Johnson of the U. S. Forest Service, and I were on the Río Santo Domingo some 31 years after Nelson, in May of 1936.

The 1936 trip was a reconnaissance to find out whether *nelsoni* could be still found and, if so, a sufficient number collected to warrant a later trip to bring them out alive for propagation in fish hatcheries. Other items of importance were road conditions, distances, and learning the main problems incident to such an effort. The reason we decided to look for Nelson's trout on the Baja California peninsula at that time rather than trout farther south from the mainland of Mexico, was that the exact locality was known in the former case while, in the latter, only vague reports of distribution were available. Roads were bad enough from Ensenada south but, at that time, practically non-existent on the mainland.

The first job, of course, was to get a nucleus of fish that could be reared to breeding age, take the eggs, and once sufficient young were available, mark and plant them under different conditions to determine experimentally whether or not these fish might actually fill a new and distinct niche in our more northerly trout waters to benefit angling in water courses long since logged off and too warm for our local strains of trout.

The 1936 trip was a rough one but over a two-week period we struggled over bad roads, roads we could not find, or mere tracks through the grass over the broad foothills on the western side of the Sierra San Pedro Martir from Ensenada to San Vicente, San Telmo, and Valladares near the Rancho San José. There we got two head of pack stock and an eleven-year-old

niño as a guide for the seven-mile trek into the Rancho San Antonio on the Santo Domingo. We found Nelson's trout abundant and easy to get. We preserved some 30 specimens for study and immediately laid plans to return in May of 1937 and try to bring them out alive. This included securing from the willing Mexican Government a *permiso* to collect the fish.

On the second trip we saved much time for we "knew the ropes." With four men in two pickup trucks and heavily loaded with gear such as six horse-pack type fish cans, four hundred pounds of water ice for cooling water in which the fish were to be transported, aeration equipment, food, and sleeping bags, we once again headed south. This time we easily secured 50 specimens of *nelsoni*, yearling age, and delivered them without loss of a single fish to the Forest Home State Fish Hatchery near Redlands, California, after 36 hours of continuous driving.

(Top) Fred W. Johnson contemplates our first trout, *Salmo nelsoni*, on the 1936 trip into the Río Santo Domingo, Baja California. (Author)

A rock through the crank case, Baja California, 1938. (Author)

En route to the Río Truchas near San Miguel, Durango, in 1952, with the three sons of Sr. Fermin Nuñez (left) and their helper. (Author)

Hand aeration of the water was necessary on the 1937 trip when 55 yearling trout were transported safely back to California. (Author)

Bargaining over the rent of two burros, Valladares, 1936. (Author)

The story of the introduction of Nelson's trout does not have a happy ending. It was one of frustration and grief. At the Redlands Hatchery, Mr. Dorrence Clanton, the foreman, took over the duty of rearing the young fish to breeding age. All went well until March, 1938, when a cloudburst hit the head of Mill Creek on which the Forest Home Hatchery was located. A torrent of water, rocks, and debris wiped out the entire hatchery and ponds, including the Mexican trout. A tragedy no less for all. Quickly making new plans, we returned a third time to Rancho San Antonio in May. This time we secured 325 fingerlings 2 to 4 inches long, alive without loss of a fish. These were placed at the U.S. Fisheries Station at the Clackamas Fish Hatchery in Oregon, where a fine supply of fresh spring water was available for rearing them.

Alas! two years later with about forty survivors between 10 and 14 inches long approaching breeding condition, an impolite frog crawled into the 2-inch pipeline supplying the pond in which they were held, stopping the flow of water. With a standpipe loose at its base, the drain leaked and emptied the pond. When the foreman came out on that sad morning, all were high and dry and quite dead.

Nobody was at fault. Losses of both lots could have happened anywhere. It was too bad these efforts were nullified after so much time and effort. Nor is this the end of the story.

World War II prevented further efforts to secure more living *nelsoni* but in 1949, when I moved to the University of California, I found a new outlet for my interest in Mexican trout. A group known as the Associates in Tropical Biogeography, on the Berkeley campus, agreed to finance three additional collecting trips down the mainland of Mexico.* These trips were also reconnaissance in nature; to find out where the trout were, of what kinds, and whether they could be collected alive. The thought here was that while Nelson's trout was readily available, quite possibly trout from the most southerly extensions of their range would be even less migratory and more tolerant of high temperatures than *nelsoni*. The Santo Domingo is really a northern stream in comparison with those of the mainland west of Durango. It lies at about 31° N. latitude; the Río del Presidio west of Durango enters the Pacific at about 24° N.

So in July 1952, with two graduate students, Jack Lattin and Stan Weitzman, and Aurelio Solorzano of the Mexican Fisheries Division, we headed west from Durango to seek "Las Truchas" from the Río Hondo in the high, rugged ranges of the Sierra Madre Occidental.

We left the main road at the village of Las Adjuntas a few miles beyond El Salto. There we found many willing collaborators in the numerous Mexican small

* The writer is deeply grateful to the Associates for their financial aid.

fry who helped us dig worms for bait. The Río Hondo, a tributary of the Presidio, the river which enters the Pacific just south of Mazatlán, was high and muddy with summer rains. But, even so, we took eight trout, all obviously members of the rainbow trout series. They were small – 3 to 7 inches – but large enough for scientific description.

We had heard in Las Adjuntas that the Río Tabacatiado, another nearby tributary of the Presidio, also contained trout; so, breaking camp, we moved some 10 miles to the edge of the barranca which held the Tabacatiado. By dint of much hard clambering over the rock-strewn stream bed, fishing with worms as the water was murky, we took 23 trout and preserved them for later study. We ate none on the entire trip, for we could never meet our quota of a minimum of 30 specimens for any given series. I am sure our guides completely discounted our ichthyological interests in these fish and on many occasions would have found exercise of their gastronomic instincts more satisfying.

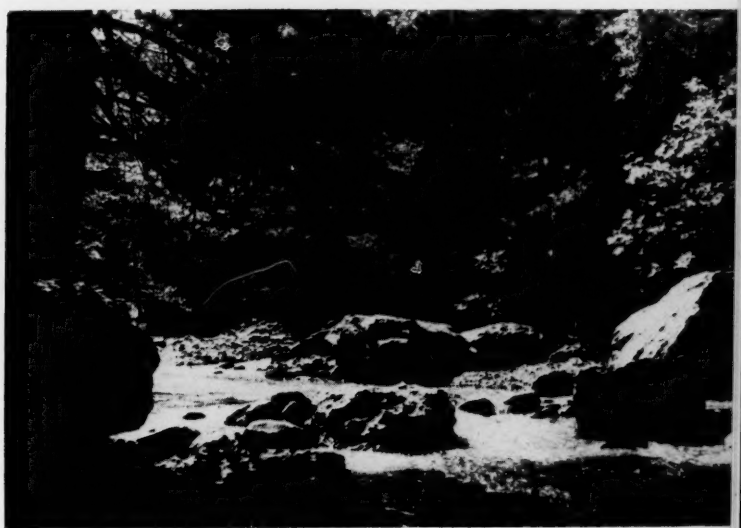
Returning to Durango for supplies, we next headed northwest for San Miguel near the Río Truchas. This stream is a tributary of the Los Remedios, which in turn is one of the main tributaries of the Río San Lorenzo that enters the Pacific about 30 miles south of Culiacán. According to competent authority, the Río Truchas has always contained trout within the memory of man – fish that could not possibly have been derived from hatchery stocks in the area.

The road – if it could be called a road – was almost impassable in places. The first day out our pickup truck got stuck three separate times in 61 miles. Heavy trucks pulled us out twice and a peon with horses the third time.

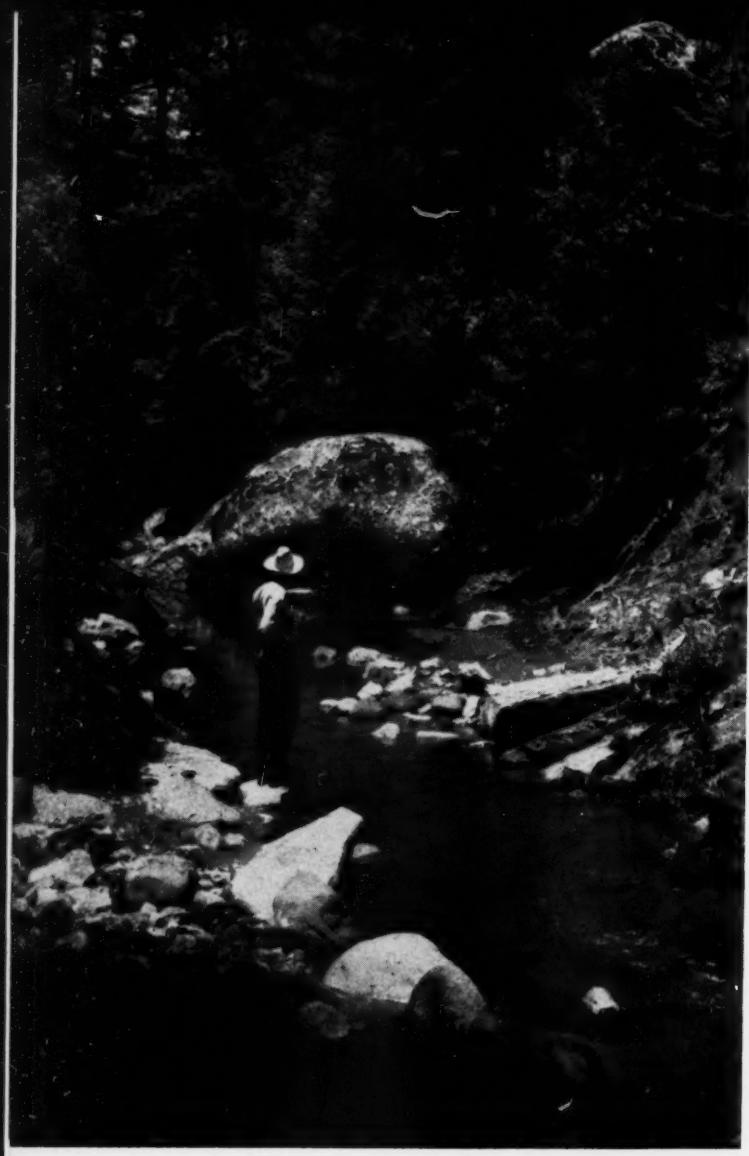
After four long, hard days we finally fought our way into San Miguel and the Río Truchas only to find it, too, high and muddy. We failed to take a single trout with rod and line, by seining, or with chemicals. When we had about given up hope of securing trout in this basin, Señor Fermin Nuñez, owner and manager of a large lumber mill at San Miguel, generously came to our rescue by producing twelve 6- to 8-inch trout from – of all places – his home deepfreeze! Unaccustomed as I am to collecting fish from my friends' freezer lockers, I must say we welcomed this gift to science with far greater appreciation than if they had been served nicely browned to us on Señor Nuñez' broad dining table. But even better, Señor Nuñez' three stalwart young sons volunteered to fish for us and secured six more specimens, much larger – 9 to 13 inches. These fish, like those from the Hondo and Tabacatiado, all appeared to be typical rainbows looking much like most any common *Salmo gairdneri* one might take fishing in streams and lakes of California's high Sierra. In any case, they were all new to science, confirming Nelson's observations of 1898 that trout did occur in the high mountain streams west of Durango.

Trail camp on the upper Río Verde (Arroyo Pedernales), Chihuahua. Elevation 7,500 feet. (Arthur O. Flechsig)

The late J. B. Stevenson of the U.S. Forest Service, looking over trout confined in a screen "live box" before loading. (Author)



Rain-swollen tributary of the Río Chinatú, a few miles south of Turguachic, Chihuahua. Elevation 6,200 feet. (Arthur O. Flechsig)



Low water before afternoon rains, Arroyo Soldado, south of Guadalupe y Calvo, Chihuahua. 7,500 feet. (Flechsig)

We liked the San Miguel country — its pines, its mountains, its deep barrancas, and its trout waters. For the first time in Mexico we felt we were truly in "trout country."

Then, as planned, I flew back to California from Durango on July 18 to return to active work at our Sagehen Creek Fisheries Project near Truckee, Jack and Stan remaining to continue the search for trout in the mountains north of Durango and southwest of Parral in southern Chihuahua.

Jack and Stan really hit pay-dirt in the form of a new Mexican golden trout from a tributary of the Río Verde. They secured 12 specimens and stimulated our interest for more thorough collections from the headwater tributaries of the Verde.

In the summer of 1953, two other graduate students of the University of California, Art Flechsig and Charlie Moller, agreed to take on the problem since work prevented me from making another trip at that time. On a three-week pack trip these two assiduous collectors got trout from the headwaters of the Río Sinaloa, Río Culiacán, and three new series from three different headwater tributaries of the Río Verde. The latter were almost exactly like the Mexican goldens taken by Jack Lattin and Stan Weitzman in 1952, and gave us excellent comparative material from different waters of the same drainage system. While our new fish from the Río Verde lacks the brilliant coloration of the California golden trout, *Salmo agua bonita,* it is beautifully golden on its ventral surface and opercles, the color fading dorsally. The bodies are heavily spotted, deep, and in all ways they are a beautiful fish. Our studies of some 40 different characters indicate it is a form completely new to science and at the moment we are in the process of describing it.

More precisely, the region covered in 1953 was in the vicinity of Guadalupe y Calvo, a mining town about 75 miles southwest of Parral. Nearby Mount Mohinora rises to an elevation of 10,335 feet and its slopes form the headwaters of several of the great

Giant cactus seems out of place so close to a trout stream! But a dense growth of willows, live oak, and alders protect San Antonio Creek from the summer sun. In this tributary of the Santo Domingo, Baja, California, trout were abundant. (Author)

rivers of Mexico, including the Yaqui, the Fuerte, Verde, Sinaloa, Culiacán, and Nazas. Here again we find confirmation of Dr. Cope's observation of 1886 that trout were present in "southern . . . Chihuahua, near the boundaries of Durango and Sinaloa."

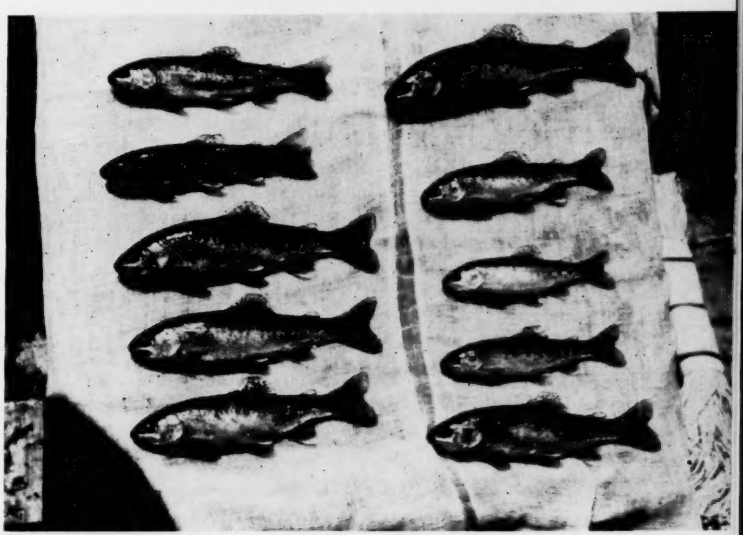
OUR LATEST EXPEDITION into Mexico was made in April of this year when Bob Rupp, a graduate student, and the writer had wonderful luck in collecting trout from the headwaters of both the Río Yaqui and Río Casas Grandes in northern Chihuahua, thus closing the last geographic gap in our collections of these forms. We now have trout from every major Pacific drainage stream from the Río del Presidio north to and including the Río Yaqui.

The Río Casas Grandes is the only *eastward*-flowing stream from which trout have been collected in Mexico. This stream was formerly connected with the Río Grande and trout native to this stream in the United States were cutthroats, being originally described as *Salmo virginalis*. But alas! – in Mexico we found they were not cutthroat; they were among the prettiest rainbows we have taken and they appear almost exactly like the rainbows taken just over the Continental Divide at the head of the Río Yaqui in Black Canyon. Fish in both collections were heavily spotted and lacked basibranchial (hyoid) teeth that are characteristically present in cutthroat trout. In addition they had the loveliest orange-tipped dorsals that stood out like signal lights. Both the pelvic and anal fins were strongly orange with white tips, as they are in most rainbows. Similar also was the strong rainbow stripe on the sides and opercle and the dark, vertical parr marks on the sides of the smaller specimens.

If the distribution of trout in Mexico followed the same continental pattern as it did originally in the United States, one would expect to find cutthroats in high western streams of the Atlantic drainage and rainbows in streams emptying into the Pacific. The rainbows from the Río Casas Grandes could have gotten there by stream capture from the Río Yaqui or they could have been planted. Since the region through which the Casas Grandes flows was settled fairly early by English immigrants and since man is known to have planted trout in that region, I am inclined toward the belief that the populations now present in both the headwaters of the Yaqui and Casas Grandes may have resulted from stocking of transplanted forms. I also feel certain that Nelson's trout from the Santo Domingo in Baja California and the great bulk of the trout from streams such as the Culiacán, Sinaloa, and Verde represent normal, natural populations as yet little affected by man's fish-cultural operations.

A last question, "How did they get there?" poses numerous problems. One explanation is the theory first proposed by Dr. B. W. Evermann in 1908 and greatly elaborated by later workers. This theory is based on the well-known fact that members of the salmon and

The new Mexican golden trout which Stan Weitzman and Jack Lattin collected from the Río Verde, August 1952. (Stan Weitzman)



Río Casas Grandes rainbows from Arroyo Seco, May 1, 1955 – a fine series for scientific study. (Author)

The author writing field notes on the tailgate of the pickup truck at Arroyo Seco, Río Casas Grandes. (Robert S. Rupp)

trout family, Salmonidae, originated in the cold waters of the Northern Hemisphere, that they were circumpolar in their original distribution, and that they could have made it into more southerly streams only by migration from the north, moving southward as steelhead or sea-run trout from stream to stream in the ocean when it was cooled by glacial run-off during past ice ages. With the retreat of glaciers northward and consequent warming of the ocean and lower stream courses in a semi-tropical region, the fish became land-locked in the stream areas that remained sufficiently cold for their continued survival. Any that attempted to migrate to the ocean would have been eliminated by excessive water temperatures. Thus we now find the non-migratory offspring of early sea-run stocks in a series of closely related, relict groups of trout isolated in the middle and upper courses of the streams draining into the Pacific in Mexico from the Sierra Madre Occidental.

Desert barriers and warm ocean areas would nowadays prevent any movement of trout from the Río Santo Domingo, for instance, around the tip of the Baja California peninsula (Cape San Lucas) into the streams of the west coast of Mexico or into the Colorado. The Colorado River cutthroat *(Salmo clarkii pleuriticus)* evidently gained access to the headwater tributaries of the Colorado by stream capture from the east slope, i.e., erosion cutting back and taking over tributaries that normally would drain eastward.

The theory of migration southward during glacial periods is further bolstered by the fact that in Asia, on the island of Formosa, is an isolated, relict Pacific salmon, *Oncorhynchus formosanum,* far south of the salmons' main range on an island cut by the Tropic of Cancer. It is quite possible that, like the trout of Mexico, this fish was able to move far south of its normal range during glacial periods and since has become effectively separated from its parental stocks by climatic and geographic barriers. Another significant point that makes me believe the trout of Mexico have been there thousands of years, is that in many instances we collected them above high falls which would obviously be impassable to trout moving upstream nowadays. Thus they must have migrated upstream before geological uplifts or erosive effects occurred that would have prevented access to upstream areas.

"In every failure there is some success." We introduced Nelson's trout twice and lost them each time. But trout from the mainland of Mexico offer even more exciting prospects for gaining a hardier, non-migratory rainbow. Maybe when we brought out those 50 yearlings in 1936, a new era was started when trout will be freely exchanged between the sister Republics to the mutual benefit of each.

THE MOST INTERESTING spot ON EARTH

NATT N. DODGE

JUST SUPPOSE that tomorrow morning at 9:15 a space ship or flying saucer were to land somewhere on our planet. Newspapers, radio, and television would have space and time for little else. The landing place would be, for the moment, "the most interesting spot on earth." Little wonder that the famous Swedish physicist Svante Arrhenius, who visited America to lecture at the University of California in 1904, so designated gigantic Meteor Crater in northeastern Arizona. For that is the spot where the largest visitor from outer space we know of plummeted to earth, perhaps 50,000 years ago, and left its mark.

And what a mark! Today, several hundred centuries later, Meteor Crater is an immense bowl blasted into the landscape more than three-fourths of a mile in diameter and 570 feet deep – so deep that a person atop the Washington Monument, were it standing on the bottom of the crater, would be unable to see out of the huge pit. The terrific, earth-shaking punch of the collision tossed hundreds of millions of tons of crushed and pulverized rock into the air to fall back into the immense hole, and pile up as a windrow around the rim. After a possible 50,000 years of settling and eroding away, the debris still forms a ridge rising 150 feet above the plain and visible for 20 miles.

Motorists traveling Highway 66 between Flagstaff and Winslow, Arizona, see the ridge rimming the crater as an unimpressive, ragged eminence in the middle distance to the south. Actually, it is only 5.5 miles by paved road from Meteor City (population 2) on U.S. 66, to the parking area on the crater rim. At a spectacular rim viewpoint, a modern museum building provides a broad platform which gives a breathtaking view of the entire interior of the huge crater. Here are exhibits of meteorites and an explanation of "falling stars." Museum attendants give a detailed interpretation of the crater, outlining the history of the various

Did a celestial 'dud'—or an 'A-bomb' from space—make Meteor Crater 50,000 years ago? Science hunts the evidence

excavations made in efforts to obtain the valuable mass of meteoritic metal believed to have blasted out the immense bowl.

Known to settlers since 1871, and to Indians long before the coming of the Spaniards, according to the evidence of a prehistoric ruin on the crater rim, the huge, symmetrical pit was first thought to be of volcanic origin. When no signs of volcanic activity were found by scientists of the U.S. Geological Survey who investigated the area in 1891, the theory of a gaseous or steam "blowout" was advanced. Although meteorites had been collected by sheep herders in the vicinity in 1886, it was not until 1903 that a Pennsylvania mining engineer named Barringer expressed belief that the great terrestial pockmark hid the resting place of a gigantic meteorite or cluster of meteorites. To back this belief, he filed mining claims and formed a company to drill for the valuable store of metal he was convinced was buried there.

Although all efforts to obtain the metal have, thus far, proved fruitless, estimates of the mass required to blast out the gargantuan hole in the earth range from a half million to 12 million tons. Some scientists are sure that the terrific heat generated by the force of an impact of this magnitude caused the cosmic projectile to vaporize leaving only remnants buried in the crater and scattered over the surrounding landscape. Analyses of the small meteorites that have been found by the thousands in the vicinity show 92 per cent iron, 7 per cent nickel, and nearly 0.5 per cent cobalt, with traces of platinum, iridium, gold, and silver. A few diamonds of the carbonado variety have been found in the meteoritic material.

Barringer continued his efforts to find and recover the supposed great mass of the meteorite over a period of 25 years, piling up costs of over half a million dollars. Drilling was always stopped, either through flooding by underground water and quicksand, or by impenetrable obstructions that either stuck or broke the drill bits. It is estimated that at least 2.5 million dollars more would be required to reach and remove commercial quantities of the buried metal – if it is there.

During recent years, extensive studies of Meteor Crater have been made by Dr. H. H. Nininger, formerly Curator of Meteorites at the Denver Museum of Natural History; and by Dr. Lincoln La-Paz, Director of the Institute of Meteoritics of the University of New Mexico. Dr. Nininger is now Director of the American Meteorite Museum at

▲ Meteor Crater, Arizona, looking south toward the outlying buttes of the Mogollon Plateau. (Courtesy Trans World Airlines, Inc.)

Sedona, Arizona. These men have found meteoritic fragments, either metallic or oxidized, within distances up to seven miles in all directions surrounding the crater. Millions of tons of sandstone were converted into rock powder by the stupendous force of the collision. This rock flour has been found suitable for making the finest quality of glass.

After years of patient research, Dr. Nininger, who is founder of the Museum at Sedona and owner of the world's largest collection of meteorites, believes he has discovered why no metallic mass has been reached by the drilling of the crater floor. It isn't there, he says. Instead, it is scattered over the surrounding plain in billions of tiny particles. He believes the meteorite – "a 500,000-ton baby planet" – vaporized upon impact and that the condensation of its vapor cloud rained the enriched nickel-iron-cobalt fragments around the point of impact which we now call Meteor Crater. Since he first began to study the crater in 1926, Dr. Nininger has been picking up the particles others have walked over for 60 years to get to the hole where they believed the solid mass to be buried. The metal has been right there, under foot.*

Whatever happened to the meteorite, its landing would have been an awesome spectacle to anyone close enough to witness it and live (according to the best scientific guesses, man did not reach this side of the globe until at least 25,000 years later). Anyhow, it is impossible to imagine the burst of blinding light; the withering, searing heat; the reeling, staggering shock as the mighty mass from outer space hurtled into the tortured earth with the roar of a thousand freight trains and a blast of compressed air of hurricane fury. Excepting the explosion of Krakatoa Volcano in 1883, only one natural occurrence comparable to that million-ton punch has taken place in historic times. On June 30, 1908, a meteoric cluster known as the Tunguska plunged to earth in Siberia. Although the largest of the resulting craters is only 165 feet in diameter and relatively shallow, the blast of this collision flattened all trees within a 20-mile radius, destroyed a herd of reindeer grazing in the area, and created such an earth shock that a locomotive engineer 400 miles away stopped the train for fear that it would derail. What must have been the effects when the thousands of times greater mass of meteoric metal collided with the earth to blast out Meteor Crater!

Nothing comparable to Meteor Crater of Arizona had been found anywhere in the world until 1943 when a similar appearing but even larger bowl, full of water, was photographed in northern Quebec across Hudson Strait from Baffin Island. Known as Chubb Crater, this symmetrical, lake-filled depression was examined in 1951 by an expedition dispatched jointly by the National Geographic Society of Washington, D.C., and the Royal Ontario Museum of Toronto, Canada. Prior to the discovery of Chubb and the magnetic, but not universally accepted, evidence of its meteoric origin, Meteor Crater was the largest of the 11 known cosmic shell holes. The list includes two near Odessa, Texas; one near Haviland, Kansas; Wolf Creek Crater in Australia; two groups near Henbury, Australia; a group on the island of Oesel in the Baltic; the Wabar Crater of Saudi Arabia; a group at Campo del Cielo, Argentina; a group in the basin of the Podkamennaya Tunguska River in Siberia; and several small craters near Ussuri, U.S.S.R. No one knows, of course, how many mighty visitors from outer space may have plunged into the oceans and disappeared without leaving a trace.

Until the Chubb Crater is positively proven to be of meteoric origin, Arizona's Meteor Crater still holds the size record. It is also the most intensively studied as well as the most accessible, being close to a major highway of tourist travel. Located as it is between two world-famous attractions, Grand Canyon and the Petrified Forest, Meteor Crater fails to receive as much publicity as it might but for this top-flight competition. Together, the three illustrate nature's remarkable versatility; Meteor Crater made in one cataclysmic flash – nature's "big moment"–and the Grand Canyon carved during millions of years by the slow processes of erosion to expose the world's oldest rocks with an estimated age of more than two billion years. Petrified Forest illustrates processes midway between the extremes.

Next time you pass through northern Arizona, don't fail to take the short side trip from Highway 66 to see for yourself the world's biggest "punch bowl." You'll be impressed with Meteor Crater, as a whole. It's out of this world! Everyone wants to know what's at the bottom of it.

*Dr. Nininger told the story of Meteor Crater and of his own researches, and presented his theories and discoveries to Members and friends of the California Academy of Sciences, at the regular monthly meeting, 12 July 1955.–Ed.

Conducted by George W. Bunton & Leon E. Salanave

To the Stars in a Jeep

Exploring for a new mountain top observatory

IN 1856 the astronomer Charles Piazzi-Smyth explored the mountainous island of Tenerife in the Canaries to test astronomical seeing conditions. Most observatories until then were at universities, in or near towns, but industry was beginning to light up and smog the air and annoy the astronomers no end. So they took to the hills, and have been doing so ever since.

We live at the bottom of an ocean of air. This atmosphere affects light passing through it in several ways. One of the most important is *refraction* (see *PD*, Sept.-Oct. 1953, p. 28). When the layers of atmosphere are turbulent, refraction is irregular and destroys the fine details that would otherwise be visible on the sun, moon, planets, and other bodies. The best partial remedy is to put as much atmosphere as possible *below* the telescope. It is not practical to locate observatories much above 12,000 feet — weather, transportation, and living conditions become too difficult. Some of the world's largest telescopes, in fact, are on peaks of moderate elevation: Lick Observatory, 4,200 feet; Mount Wilson, 5,700 feet; Lowell, 7,200 feet; McDonald, 6,800 feet; Palomar, 5,600 feet.

To get nearly dust-free air, with a minimum of daytime heat radiation from the earth's surface — conditions especially desirable for solar research — astronomers can look for alpine locations inland, or for high elevations near the sea. Maritime locations require prevailing onshore winds to bring constant clean air, and a good vegetation cover to minimize the effects of heat radiation, day and night.

The top of Mount Hamilton, with its Lick Observatory, has proven to be one of the world's finest sites for astronomical work. It is not particularly high (4,200 feet), and its slopes have much bare, dusty rock. But on some occasions the air above the mountain is as clear as at an alpine site. Lick astronomers attribute this to practically dust-free masses of air coming off the Pacific 30 miles away, overriding the dusty layers from the valley below. When I learned of this, I decided to search a map of coastal California for a mountain both nearer the ocean and higher than Hamilton — such a location, I thought, should be still better than Lick's. I found that Junipero Serra Peak, in the Santa Lucia range in Monterey County, is 5,862 feet high and its summit only 12 miles from the ocean. It is the highest point in the southern Coast Range.

The region is extremely primitive, with no ordinary roads. The nearest town is King City, a small community 17 miles to the east. The Academy's Astronomy and Botany departments made a joint expedition to the Santa Lucias in mid-May this year. (Obviously, no matter what the sky was like, a botanist could — and John Thomas Howell did — make the trip worth while in terms of collecting for the Herbarium.) Junipero Serra Peak is in Los Padres National Forest; jeep transport for the upper stretches was generously provided by the district forest ranger, Mr. Alex Campbell.

The pictures give some idea of the adventurous trip to the summit and the setting up of our astronomical equipment. This consisted of a specially assembled 3-inch refractor in a light wooden tube, and a camera equipped with an F/4 wide-angle lens and fast film. The former was to be used in testing the quality of the seeing, on both sun and stars: the latter was intended for long exposures on the night sky to determine how dark it was.

During our stay of three nights and four days, a brisk northeasterly wind blew almost continuously. No prevailing wind came in off the Pacific, so my hypothesis of super-clean ocean air could not be tested. However, I noted some very blue sky part of the time, and we had a spectacular sunrise view of the Sierra Nevada 175 miles to the east. Brisk wind and good seeing are usually not found together, but even under

▲ The jeepway to Junipero Serra Peak — grade "less than 32 per cent." The Willys Jeep truck was provided for the Academy expediton by the U.S. Forest Service. Curator Howell hanging on.

the conditions just described there was some fine seeing. For example, Saturn was observed with a magnification of 200 times, and its image appeared satisfactorily steady. Under a magnification of 300, which is generally considered the limit for a telescope of 3 inches aperture, star images remained well defined though seeming to "dance." Double stars were resolved to the optical limit of the telescope. Subsequent study of the photographic record of the night sky shows it was indeed very dark; the film was fogged very slightly after an hour of exposure. Also, it was possible to see stars through the telescope about *twice* as faint as one usually expects from its light gathering power. Half a dozen faint nebulae were observed around the galactic pole. Impressive views of the zodiacal light and dark lanes of the Milky Way, without optical aid, confirmed the absence of artificial light.

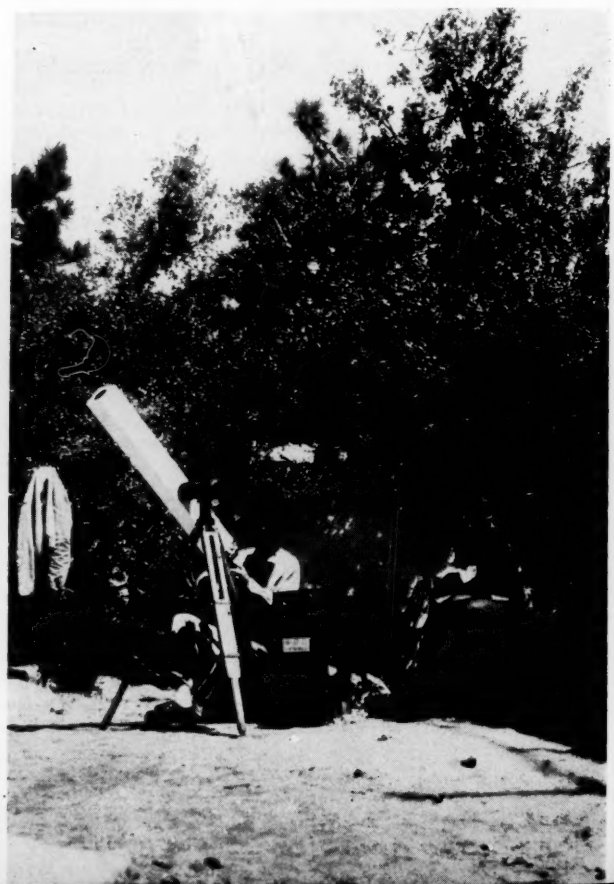
Daytime seeing on the sun did not come up to expectations, but results were not completely disappointing. Some fine details could be seen in the penumbral region of a sunspot, and in the granulated structure of the photosphere.

All in all, this tentative exploration of Junipero Serra Peak leaves us with the impression that its astronomical potentialities merit further investigation.

L.E.S.

← Botanist John Thomas Howell watches Leon Salanave, Morrison Planetarium astronomy lecturer, make adjustments on his astronomical equipment. Center, the camera for testing night darkness by long exposures on the north polar region; right, the 3-inch refractor for observing sun and stars; sign below U.S.F.S. tower reads "elevation 5844 feet."

↑ Junipero Serra (formerly Santa Lucia) Peak, looking west. The country rock is granite, with dense chaparral cover everywhere except at the summit and on the north slope, where pines take over. Jeep road to the left ascends the southern slope. The ocean is only 12 miles away from the 5,862-foot peak.



→ The author setting up his telescope to observe the sun. White canvas sheet behind him is a windbreak — an essential part of the equipment when strong northwesterlies blew.

Capital scientist in lower case

George Davidson: *pioneer west coast scientist.* By Oscar Lewis. University of California Press, Berkeley and Los Angeles. 1954. x + 146 pp., illus., endpaper maps. $3.50.

The first problem of the reviewer is whether to cite this volume literally or literately. The subtitle is printed in lower case letters as cited above, as are likewise the chapter headings, leading to such anomalies as "u. s. coast survey," "alaska," "james lick," and – Heaven (or heaven) help us – "the california academy of sciences." Otherwise the book, which we note was designed by Marion Jackson (not marion jackson), is attractively done, with endpapers and dustjacket adorned with early Coast Survey maps prepared by Davidson or under his supervision. The illustrations are well selected, but lose something in reproduction by photo-lithography.

The typographical idiosyncrasy above referred to, which would be more appropriate to a book of modern verse than to the biography of a pioneer scientist, supplies a clue to what is the matter with this book. Nobody who had anything to do with it seems really to have gotten into the spirit of the thing. Oscar Lewis is a good writer and a competent historian, but this is not his best work. This biography was written and published to carry out one of the terms of the will of George Davidson's daughter, the late Ellinor Davidson; and it conveys more than a hint of a chore completed rather than a labor of love.

There is an unnecessarily large number of loose statements and inaccuracies. Too often the author refers to "the early 1850's" or "the mid-1870's" instead of ferreting out a specific date. He states (p. 60), "At what date Davidson's connection with the Academy began is not precisely known. . . ." This is known. Davidson became a member of the Academy January 18, 1869.

On page 34 is recorded the birth and death of a son, George, who was born in 1859 and died in 1861. On page 127 we read of the death by suicide in 1900 of "thirty-eight-year-old George F. Davidson," who was thus apparently born in 1862. One surmises that the Davidsons, having lost their first-born, also named their second son George; but the biographer does not comment on this, and makes no effort to clear up the mystery of the two sons named George.

On page 75 the biographer states, "One day in the mid-1890's word reached Davidson that an Oakland man, a butcher, had developed a keen interest in astronomy . . . and was endeavoring to construct a home-made telescope. . . . Davidson forthwith hunted up the amateur . . . and presently brought the matter to an acquaintance, the Oakland capitalist and philanthropist Anthony Chabot. The result was that Chabot not only financed the building of the observatory that bears his name but installed the former butcher as its director."

Dr. Earle G. Linsley, retired director of the Chabot Observatory, informs me that the Observatory was founded in 1883, with considerable fanfare and with George Davidson as one of the honored guests, that the amateur astronomer who became its director was not a butcher but an insurance man named Charles Burckhalter, and that Chabot provided only the telescope, not the building, which was originally known as the Oakland Observatory.

Despite these and other inaccuracies, this book serves an important purpose. It rescues from undeserved obscurity the memory of a remarkable man. Davidson's name is perpetuated in the names of Mt. Davidson, San Francisco; Mt. Davidson, Nevada; Mt. Davidson, the Davidson Range, the Davidson Glacier, and Davidson Inlet, Alaska; the Davidson Current along the California coast, the Davidson Seamount, and numerous other geographical features. Yet it is doubtful that one person in a thousand on the Pacific Coast knows who George Davidson was. This biography by Oscar Lewis answers the question. It provides a good deal of information in easily readable form; and if it appeals more to the general reader than to the critical scholar, that may in one sense be a virtue.

George Davidson was the Benjamin Franklin of the Pacific Coast. Though not a printer, he exercised in other respects much the same influence in San Francisco that Franklin had in Philadelphia a century before. Largely self-educated and without university training, he became a distinguished scholar and was, as Lewis states, "widely regarded as the dean of western scientists."

Coming to the Pacific Coast in 1850 for the U. S. Coast Survey, he mapped the entire Pacific Coast from Lower California to Alaska, and wrote the first and several subsequent editions of the *Coast Pilot*, originally entitled "Directory for the Pacific Coast" and long referred to by mariners as "Davidson's Bible." With headquarters in San Francisco, he entered actively into community life and became identified with most of the important scientific undertakings of his time and place for the next half century and more.

Davidson was president of the California Academy of Sciences for sixteen years, from 1871 to 1887. During this period the Academy opened its first public museum, and grew from a small, struggling organization to an institution of world-wide renown. Davidson secured important gifts for the Academy from Charles Crocker, Leland Stanford, and James Lick. He also persuaded Lick to endow the Academy, and to build the Lick Observatory. He built his own observatory in San Francisco, where he maintained a gruelling schedule of nocturnal observation in addition to his usual daily work.

He was a founder and first president of the Geographical Society of the Pacific, a presidency which he held for thirty years until his death in 1911.

In 1870 Davidson was appointed non-resident professor of geodesy and astronomy in the University of California, and served as a member of the Board of Regents from 1877 to 1884, being possibly the only professor who has ever served in this dual capacity. In 1898, while still holding his earlier professorship, he received a second appointment as professor of geography, and for the next seven years (from the age of 73 to 80) he served as an active member of the faculty, retiring only when failing eyesight progressed to nearly total blindness.

To a generation to which George Davidson is only a name, this biography brings the best account available of an intellectual giant, a pioneer in the literal and the figurative sense, who left a permanent imprint on the history of science. R.C.M.

Mosquitoes, mushrooms, and man

Mosquitoes: *Their Bionomics and Relation to Disease.* By William R. Horsfall. The Ronald Press Company, New York. 1955. viii + 723 pp. $16.00.

This is an encyclopedia of the biology, distribution, and medical importance of the mosquitoes of the world. The more important species are treated in greater detail, and the lesser-known are tabulated. The arrangement of this information follows the classification of mosquitoes. This book supplements the many available references emphasizing mosquito identification. No keys, descriptions, or illustrations to aid identification are presented, for the user is expected to already know the name of the genus or species about which he seeks information.

The Natural History of Mosquitoes by Marston Bates (1949) is recommended for teachers and others who seek a more general "text" on mosquitoes. E.S.R.

Mushrooms and Toadstools: *A Study of the Activities of Fungi.* By John Ramsbottom. Collins, London. 1953. (Distributed in U. S. by Macmillan.) xiv + 306 pp., 46 full-color, 24 halftone plates. $6.25.

One of the Collins "The New Naturalist" series, this distinguished volume is a characteristically British nature book, from the solid, tasteful format, excellence in typography and presswork, to the understatement of the title and the slightly Charles Addams implications of the subtitle. The understatement lies in the fact that the whole fungus world is covered, from truffles to penicillin. And Addams' eye, we are sure, would gleam at the exquisite photographs of *Coniophora* strands spreading over a damp wall or the full-color views of *Merulius lacrymans* invading an abandoned dwelling even to the point of blanketing teakettles where they lie, as well as cratering the floor with gaping holes. The whole world is covered with fungi!

Replete as it is with historical and literary citations, mythological references, and magical lore, as well as learned scientific description, this is a compound of human and natural history and ranges over the earth.

Southwest: Arquebus to A-bomb

A good setting-up exercise before taking on any book about the Southwest — land, life, history — would be to read or reread the introductory pages to J. Frank Dobie's **Guide to Life and Literature of the Southwest** *(Southern Methodist University Press, Dallas, 1952, viii + 222 pp., illus., $3.50). Since the books about to be mentioned are history, this from Professor Dobie is to the point: "Among historians of the Southwest the general rule has been to be careful with facts and equally careful in avoiding thought-provoking interpretations. In the multitudinous studies on Spanish-American history all padres are 'good' and all conquistadores are 'intrepid,' and that is about as far as interpretation goes. The one state book of the Southwest that does not chloroform ideas is Erna Fergusson's* **New Mexico:** A Pageant of Three Peoples *(Knopf, New York, 1952) [xii + 408 pp., 26 photos, 2 maps. $5.00]). Essayical in form, it treats only of the consequential. It evaluates from the point of view of good taste, good sense, and urbane comprehension of democracy. The subject is provincial, but the historian transcends all provincialism. Her sympathy does not stifle conclusions unusable in church or chamber of commerce propaganda. In brief, a cultivated mind can take pleasure in this interpretation of New Mexico. . . ." What better criteria for "regional" literature?*

Most of us, we dare say, were well out of the grades before we got much beyond the Pilgrim Fathers and the Thirteen Colonies in our grasp of the American background. De Soto, Coronado, and Ponce de Leon were paraded briefly by, but how much appreciation did we get of the massive and continuous role in shaping our history of Spain's three hundred-year effort to dominate the continent? One of our own chief pleasures out of school has been the discovery of history between Gulf of Mexico and Pacific. These pass the Dobie test with honor:

Glory, God and Gold: *A Narrative History.* By Paul I. Wellman. Doubleday & Company, Inc., Garden City, New York. 1954. xii + 402 pp., 9 maps. $6.00.

An advantage we see to missing most of the great story of Spanish-American history in school is that it comes later in the form of living literature, not in the dry dust of textbooks. What an adventure history could be in high school if the conventional texts were replaced by such books as this! Here is "the story of five different peoples: Indians, Spaniards, French, Mexicans and Americans" told through "the lives and deeds of the men and women" who acted out the history of our Southwest. "Our Southwest" was the "North" of New Spain and of Mexico and what went on there from Cabeza de Vaca to Sam Houston is the joint history of two nations. This fact sets it apart at once from our other chief nexus of historical forces, the Atlantic Seaboard. One thing may be granted in common, up to a point: the mother country-colony relationship. In this respect Spain far outdid England in matters of control and exploitation, or so it seems as we read of the intricate, ponderous, and theoretically all-powerful machinery the Spanish monarchy set up to keep the plunder and proceeds flowing homeward.

The thing that flowed most slowly back to the home office was a clear picture of the vast land its captains and priests were sent to conquer, pacify, Christianize, and keep producing. It was the land, illimitable, inhospitable, all but unconquerable it too often seemed, that determined the acts of the king's men, more than the royal *cedulas* that came after months at sea often to permit or forbid something long since done. By and large, the Spanish conquistadores and colonizers were as tough, brave, and resourceful a breed as the world has even seen, be it gold, glory, or the souls of the heathen they sought. In the give and take, they were a match for the land because they could live on bootleather and prayer when they snapped their taut supply lines to see what lay beyond the next desert or mountain range. The French, too, contributed their share of hardy and colorful characters — that swashbuckling opportunist St. Denis pales any movie hero — and of course Texas won't let its hell-for-leather frontier types fade from history any more than the Alamo.

From the "Seven Cities of Cíbola" to the Alamo to Alamogordo, Paul Wellman has mixed the ingredients of Southwest history into a hearty and satisfying dish. Those were stirring times, on both sides of the Rio Grande.

Great River: *The Rio Grande in North American History.* By Paul Horgan. Rinehart & Company, Inc., New York. 1954. xv + 1020 pp., 4 maps. Two vols., slipcase, $10.00.

The indivisibility of Mexico and America in the fabric of their history has perhaps never been more sharply expressed, or with clearer insight, than through Paul Horgan's

use of the Rio Grande as leit-motif in his sweeping drama of four hundred years on the borderland. The four centuries comprise history as we know it; back of them are the eons of geologic time in which the River was born, and the millennia of human time in which Indians came to make it the source and stay of their timeless living – these are the foundation-stones of this carefully structured book.

When the level of recorded history is reached, with "The Spanish Rio Grande," the structure grows according to the blue-print of the chronicles and we reach in turn the "storeys" of "The Mexican Rio Grande" and "The United States Rio Grande" with Volume 2. The pace of building is deliberate; every stone is weighed and examined. Sometimes we move far from the river to see how and why a certain part of the structure got its shape, as for instance when we visit the Escorial – for the mystic nature and inmost thoughts of a Charles V had much to do with the shaping of history on the Rio Grande. Indeed the revelation of the Spaniard as a man of the Middle Ages driven by his particular nature to his predestined impact on the New World is one of the powerfully moving parts of this book. Behind the individual is the type, and the type of the Spanish conquistador stands revealed in all his somber and tragic grandeur. Behind him as he stood on the Rio Grande with sword and cross was administrative genius of a unique order which, though foredoomed through the inward exhaustion of inflexibility and greedy purpose, could transplant a culture and lay the foundations of a nation. Wellman's is the fast-paced narrative; Horgan tells the story too, but he takes time to round out the picture, to look behind the immediate scene to the farthest background and the innermost springs of action. And he can dwell on the scene itself, as when he describes in minute detail the home, the dress, the table fare, the whole life of Indian or colonist on the Rio Grande. D.G.K.

DISCOVERY IN BOOKS

Many Mexicos: for reading on the road

Zapotec. By Helen Augur. Doubleday & Company, Inc., Garden City, New York. 1954. 279 pp., 24 photographs, 2 maps. $4.50.

This book about the land and peoples of the western slope of the Isthmus of Tehuantepec has been mentioned and quoted editorially in this issue, and the remarks will not be repeated in review. There is another aspect of this book, by the author of *Tall Ships to Cathay* and others of an historical and biographical nature, that deserves comment. Readers have surely noticed that *PD* has a good deal to say, in articles, editorials, and reviews, about American origins, i.e., the *aboriginal* discovery, settling, and partial civilizing of our two Pacific-bound continents. Interest in these things is one of our prime reasons for being. So when in the course of reading this charming book about the present and past of southernmost Mexico the reviewer suddenly found himself on the verge of an intriguing new theory of trans-Pacific discovery, he felt like one who has just been handed an unexpected dividend.

We admire Miss Augur's courage. Making it plain she is no anthropologist or otherwise qualified expert, she dares to risk her scholarly reputation on the outermost frontier of controversial theorizing about the sources of pre-Columbian civilizations in the New World. Moreover, she eagerly embraces guilt-by-association with such known heretics as Fairservis, Ekholm, and Heine-Geldern (though she attempts to excommunicate another arch-diffusionist in her scorn of Gladwin's "Nearchus" theory). But on the other hand she admits she has no reputation to lose in *this* particular field, and plunges in without further ado.

What she comes up with is the idea that "the Middle American culture" as she terms it was sparked by nothing less than "a tremendous religious movement" transplanted from Asia across the Pacific by island-hopping, a planned missionary venture teed off and personally conducted by a hierarchy of astronomer-priests bent on spreading the worship of "the sky gods" to the entire world! They came eastward, she postulates, via the high islands, making the last long jump to the Gulf of Panama from the Marquesas, possibly by way of Peru and/or the Galápagos Islands. It must be noted here that in calculating distances she has – if we read her right – made a king-size slip. "From the Marquesas to Peru," she states, correctly enough, "there is a stretch of four thousand miles." Then she cites Heyerdahl's recent findings in the Galápagos to support her idea of a landing and final jump-off from those islands. We quote: "If voyagers left the Galápagos, the equatorial counter-current would have helped them across the three thousand miles to the Gulf of Panama." Now a quick chart-check gets us at best some 700 nautical miles, the Galápagos to Panama. We mention this in passing – the correct figure favors Miss Augur's theory by 2,300 miles!

Well, perhaps she is smiling at her own audacity: "Thus we arrive at a romantic version of the discovery of America: The world's supreme astronomers [i.e., the ancient Asiatic priest types] saw this event foretold in the stars, and they had the authority to command that the feat be accomplished." The logic of Miss Augur's subsequent arguments is beautiful, as much so as that of Heyerdahl's and Gladwin's, neither of whose theories she accepts. But of course it is the beauty of a nicely arranged sequence of large and tantalizing *ifs*. Doubtless the conservative school of anthropologists will hardly trouble to answer this challenge, because it does not even come from a maverick on their own range. Miss Augur enjoys the immunity of the complete outsider. But – let the conservative gentlemen proprietors not bask in a guarantee of perpetual order in their established domain. Many an intellectual china shop has been rudely shattered by a fancy-free – your pardon, Miss Augur – bull with disestablishmentarian ideas. We think the origins-of-American-cultures controversy is a good one to keep kicking the dust off. The final answers are still buried, somewhere. . . .

Temples of the Sun and Moon: *A Mexican Journey.* By Michael Swan. Jonathan Cape, London. 1954. 288 pp., 36 photographs, endpaper map. 21s.

One travel book may leave you with a head swimming full of facts – how far from here to there, how long it takes, where to stay and eat, what the place produces. If it hangs somewhere between a real book of travel and a guide book, it may not amount to a good example of either. But when a highly literate, sensitive, openminded, and large-hearted person combines a gift of expression

with a passion for extracting the last drop of experience out of every situation he happens, or contrives, to be in – when such a person is your "guide" on the byways of such a country as Mexico, his experience falls upon you like a rich mantle. Michael Swan is such a person; the area of experience in *Temples of the Sun and Moon* is embraced by Mexico City's environs at one limit, British Honduras at the other, with the Isthmus of Tehuantepec and the peninsula of Yucatán between. Michael Swan's literateness puts meaning into what he sees, in terms of art, architecture, history, and literature – he commands allusion without making a show of it. His sensitiveness is to the elements of beauty, the moods of places, the "tune" of life around him. His openmindedness assures the acceptance at their own standards of those among whom he is the alien. His large-heartedness makes him on occasion step out of the role of bystander and enter to good effect into a human situation.

This appraisal of an author sounds fulsome, and might suggest that this young Englishman's book is a bit stuffy, and all that. It isn't. The idea intended is that of something quite out of the ordinary in travel literature.

Life in the Imperial and Loyal City of Mexico in New Spain *and the Royal and Pontifical University of Mexico as Described in the Dialogues for the Study of the Latin Language Prepared by Francisco Cervantes de Salazar for Use in His Classes and Printed in 1554 by Juan Pablos.* Now Published in Facsimile with a Translation by Minnie Lee Barrett Shepard and an Introduction and Notes by Carlos Eduardo Castañeda. University of Texas Press, Austin. 1953. vii + 113 pp., collotype reproduction of original. Slipcase, $7.50.

An extraordinarily beautiful book of intrinsic interest and great historical significance in the annals of New World scholarly publication, this edition of *The Dialogues* of Cervantes de Salazar marks the 400th anniversary of the founding of the first university in the New World. Since it actually came off the press at Austin in 1954, it appeared exactly 400 years after its original printing by the first commercial printer in the New World, Juan Pablos having been sent out under contract by the famous printer-publisher of Seville, Juan Cromberger, to establish in New Spain a branch of his house.

The most general interest this work has for modern readers is that of its contemporary description of Mexico City and its environs and life some 30 years after the Conquest. It is particularly valuable reading for students and teachers attending Mexico's centers of higher learning, perhaps especially for giving an appreciative sense of the venerableness of the Universidad Nacional de México, and an historical view of the City of Mexico itself. It is, besides, a collector's item among notable modern fine books.

Arte antiguo de México. By Paul Westheim. (Translated from the German into Spanish by Mariana Frenk.) Fondo de Cultura Económica, México and Buenos Aires. 1950. 356 pp., profusely illustrated in halftone and line, full-color frontispiece. $35.00 (Mexican).

If you read Spanish and have an interest in Mexican antiquities – architecture, sculpture, the codices – and their historical and artistic significance, you will want to buy this book in Mexico to study as you visit the museums and archeological sites. (We have not been able to ascertain, even with the help of the University of California Library, whether there is either a German or an English edition available.) With its fine illustrations – there are many full-bleed halftone pages – this is a beautiful example of Mexican book printing, which should be in any library of the world's great art, and available to any student of Mexican archeology and history. It admirably carries forward the graphic and scholarly traditions of Mexican publishing begun by Juan Pablos in 1540.

Speaking from our own experience, we would say that for reading the easy Spanish of this book a background in the subject matter is more essential than fluent Spanish. The vocabulary is recognizable with ease if you have it already in English. It is the most complete analysis we have found so far of the esthetics of pre-Columbian Mexican art in terms of the theological and metaphysical beliefs of the civilized Indians who produced the magnificent art we classify as Aztec, Toltec, Olmec, Zapotec, Tarascan, Mayan, etc. Drawing on the authorities in the field – Seler, Thompson, Morley, Saville, Caso, Spinden, Vaillant, et al., including the earlier writers such as Sahagún and Landa – Paul Westheim has synthesized the primary sources into a critical abstract of esthetic, hieratic, scientific, and historical values for the cultures defined. The various elements are grouped under three main heads: The Concept of the World, Expression, and The Creative Will (assuming the literal translation of *La voluntad creadora*). Unfortunately the text is not indexed and the very frequent citations of sources are parenthesized in the text only and not given in bibliographical form. These lacks will be felt by the student, mainly, but are also harassing to an editor! D.G.K.

Made in Mexico: *The Story of a Country's Arts and Crafts.* By Patricia Fent Ross. Illustrations by Carlos Merida. Alfred A. Knopf, New York. 1952. xx + 329 + xiv pp., 74 photographs, many line drawings, maps. $4.00. A copy of the first edition was kindly furnished by the publisher for the purposes of our editorial. Because this printing is about exhausted, some book stores may be temporarily out of stock – but we are advised that a new printing will soon be on the market. This attractive and useful book is a must for anyone buying craftwork in Mexico who would distinguish the authentic from the common "tourist stuff." Bibliography and index.

Tourist Guide to Mexico. By G. M. Bashford. McGraw-Hill Book Company, Inc., New York. 1954. xii + 304 pp., 5 transportation maps, 16 trip maps, 4 city maps. $4.50. How to plan your trip, where to go, stay, eat, buy, get your car repaired (by standard makes), what to see, the fiestas (place and date), language tips, educational opportunities – and a wealth of other information, including an outline of Mexican history. A amazingly complete guide for the traveler with his own car. Completely indexed.

New Guide to Mexico: *Including Lower California.* By Frances Toor. Crown Publishers, Inc., New York. 1954. 288 pp., illus., maps., index. $2.95. "Completely revised and augmented," this handy little guide has been through numerous printings since 1948. More complete descriptions of places than in Bashford's guide (which omits Baja California altogether). With *both* guides in hand, it is hard to imagine how one could miss anything of interest!

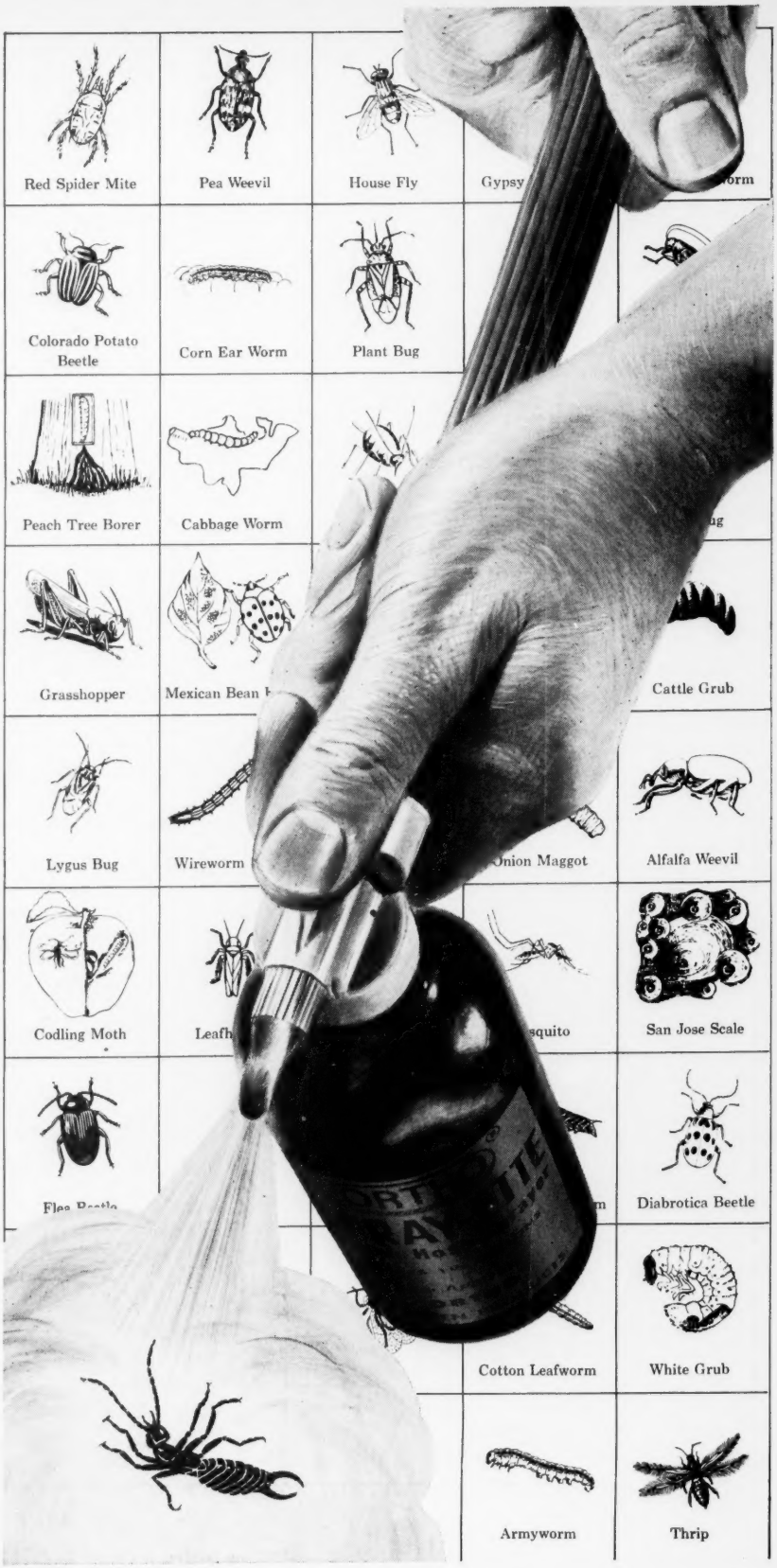
There's not enough food for you and the bugs

As any backyard gardener knows, you have a fight on your hands from the moment you turn over your first spadeful of earth. At every step, fungus growths, weeds, and insects that chew, insects that suck are waiting to destroy your lawns, trees, plants, flowers. It is a disheartening struggle for Greenthumbers . . . a round-the-clock fight for commercial farmers.

Fortunately, there's a growing list of weapons we now can wield in the battle against bugs. Some of the most effective have been developed in the laboratories of California Spray-Chemical Corporation, a Standard Oil Company of California subsidiary. In 1907, we brought out the first basic lead arsenate to stop the codling moth, a rampaging fruit crop destroyer; later, the invention of new-type summer and dormant oil sprays safely checked scale and other insects.

Other Standard research achievements have been chemicals to kill aphis, mites, thrips, and similar sucking insects . . . dusts to destroy fungus diseases like rust, blight, mildew...sprays and dusts custom-made to knock out such public enemies as the devastating grasshopper, boll weevil, hornworm. Other pest-killers boost milk production from our dairy herds, help beef cattle fatten faster.

One good reason you live in the world's best-fed nation is because insect invaders have been held back on our farms, ranches, and orchards, thanks in part to Standard's constant hunt for new ways to make petroleum do more things for you.



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